

**Final Total Maximum Daily Load for *E. coli*
9 Stream Segments within the Cox Creek Watershed
Nelson, Bullitt and Spencer Counties, Kentucky**



Cox Creek, Nelson County, KDOW

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Nelson, Bullitt and Spencer Counties, Kentucky

June 2013

**Kentucky Department for Environmental Protection
Division of Water**

This report is approved for release


Sandra L. Gruzesky, P.E., Director
Division of Water

5/17/13
Date



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*****All figures created by KDOW TMDL Section within a Geographic Information Systems framework (ArcMap 10.0) in 2012, unless otherwise noted. Most of the GIS data collected for the development of this document can be accessed and downloaded from the Kentucky Geography Network (<http://kygeonet.ky.gov>).

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Glossary of Acronyms

ADD	Area Development District
AFO	Animal Feeding Operation
AWQA	Agriculture Water Quality Act
BMP	Best Management Practices
BMU	Basin Management Unit
CAFO	Confined Animal Feeding Operation
CFR	Code of Federal Regulations
CPP	Continuing Planning Process
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSO	Combined Sewer Overflow
DEP	Department of Environmental Protection
DMR	Discharge Monitoring Report
DOC	Division of Conservation
ft ³	Cubic feet
GIS	Geographic Information System
GNIS	Geographic Names Information System
HUC	Hydrologic Unit Code
KAR	Kentucky Administrative Regulations
KDFWR	Kentucky Division of Fish and Wildlife Resources
KDOC	Kentucky Division of Conservation
KDOW	Kentucky Division of Water
KGS	Kentucky Geological Survey
KRS	Kentucky Revised Statutes
KIA	Kentucky Infrastructure Authority
KNDOP	Kentucky No Discharge Operational Permit
KPDES	Kentucky Pollution Discharge Elimination System
L	Liter
LA	Load Allocations
LTCP	Long Term Control Plan
MAF	Mean Annual Flow
MGD	Million Gallons per Day
MHP	Mobile Home Park
ml	milliliter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer Systems
NASS	National Agricultural Statistics Service
NHD	National Hydrography Dataset
NLCD	National Landcover Database
NRCS	Natural Resources Conservation Service
NPDES	National Pollution Discharge Elimination System
NPS	Nonpoint Source
NOV	Notice of Violation

Total Maximum Daily Load (TMDL) Synopsis

OSTDS	On Site Sewage Treatment and Disposal System
PCR	Primary Contact Recreation
PCS	Permit Compliance System
POTW	Publicly Owned Treatment Works
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RM	River Mile
SCR	Secondary Contact Recreation
SOP	Standard Operating Procedures
SSO	Sanitary Sewer Overflow
STP	Sewage Treatment Plant
SWPB	Surface Water Permits Branch
SWS	Sanitary Wastewater System
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WAH	Warm Water Aquatic Habitat
WBID	Waterbody Identification Number
WBP	Watershed Based Plan
WLA	Waste Load Allocation
WMB	Watershed Management Branch
WQB	Water Quality Branch
WQC	Water Quality Criteria
WQS	Water Quality Standard
WWTP	Wastewater Treatment Plant

Total Maximum Daily Load (TMDL) Synopsis

State: Kentucky

Major River Basin: Salt

USGS HUC8 #: 05140102

County(s): Nelson, Bullitt and Spencer

Pollutant(s) of Concern: *E. coli*

Table S.1 Impaired Waterbodies Addressed in this Bacteria TMDL Document

Waterbody Name	Pollutant	County	GNIS Number	Suspected Sources	Impaired Use (Support Status)
Cox Creek 0.0 to 4.7	<i>E. coli</i>	Bullitt	KY490220_01	Nonpoint Sources	PCR (not supporting)
Cox Creek 4.7 to 11.4	<i>E. coli</i>	Nelson	KY490220_02	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)
Cox Creek 11.4 to 18.6	<i>E. coli</i>	Nelson	KY490220_03	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access, Other Permitted Small Dischargers	PCR (not supporting)
Cox Creek 18.6 to 23.9	<i>E. coli</i>	Nelson	KY490220_04	Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers	PCR (not supporting)
Caney Fork 0.0 to 4.0	<i>E. coli</i>	Nelson	KY488864_01	Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers	PCR (not supporting)
East Fork Cox Creek 0.0 to 4.3	<i>E. coli</i>	Bullitt	KY491454_01	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)
Froman Creek 0.0 to 1.25	<i>E. coli</i>	Nelson	KY492574_01	Nonpoint Sources, Agriculture, Unrestricted Cattle Access	PCR (not supporting)

Total Maximum Daily Load (TMDL) Synopsis

Waterbody Name	Pollutant	County	GNIS Number	Suspected Sources	Impaired Use (Support Status)
Rocky Run 0.0 to 2.3	<i>E. coli</i>	Bullitt	KY502264_01	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)
West Fork Cox Creek 0.0 to 6.9	<i>E. coli</i>	Bullitt	KY506428_01	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)

Kentucky Water Quality Criteria (WQC) and the TMDL Endpoint (i.e. Water Quality Standard/ TMDL Target):

Title 401 KAR 10:031 describe the standards used to “protect the surface waters of the Commonwealth, and thus protect water resources.” *Escherichia coli* (*E. coli*) bacteria are pathogen indicator organisms. *E. coli* data are used to indicate the degree of support for primary contact recreation (PCR) use. The stream is assessed as fully supporting the PCR use if the *E. coli* content does not exceed the criterion of 240 colonies per 100 ml in less than 20 percent of samples; it was assessed as partially supporting the PCR use if the criterion was not met in 25-33 percent of samples, and as not supporting the PCR use if the criterion was not met in greater than 33 percent of samples. Streams assessed as either nonsupport or partial support are considered impaired. Stream segments were sampled during twelve sampling events through the PCR season of May 1 through October 31, 2009.

The WQC in 401 KAR 10:031 (Kentucky’s Surface Water Standards) for the PCR use are based on both fecal coliform and *E. coli*. Per 401 KAR 10:031:

“The following criteria shall apply to waters designated as primary contact recreation use during the primary contact recreation season of May 1 through October 31: Fecal coliform content or Escherichia coli content shall not exceed 200 colonies per 100 ml or 130 colonies per 100 ml respectively as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 400 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for fecal coliform or 240 colonies per 100 ml for Escherichia coli.”

The instantaneous criteria of 240 *E. coli* colonies/100 ml was applied to calculate allowable loadings to bring the watershed into compliance with the PCR designated use. The TMDL Target is defined as the WQC minus the Margin of Safety (MOS). The MOS can be an implicit or explicit additional reduction applied to the Waste Load allocation (WLA), Load Allocation (LA) or to both types of sources that accounts for uncertainties in the data or TMDL calculations. The TMDL Target is thus 216 colonies per 100ml (240 col/100ml minus a 10% MOS).

Total Maximum Daily Load (TMDL) Synopsis

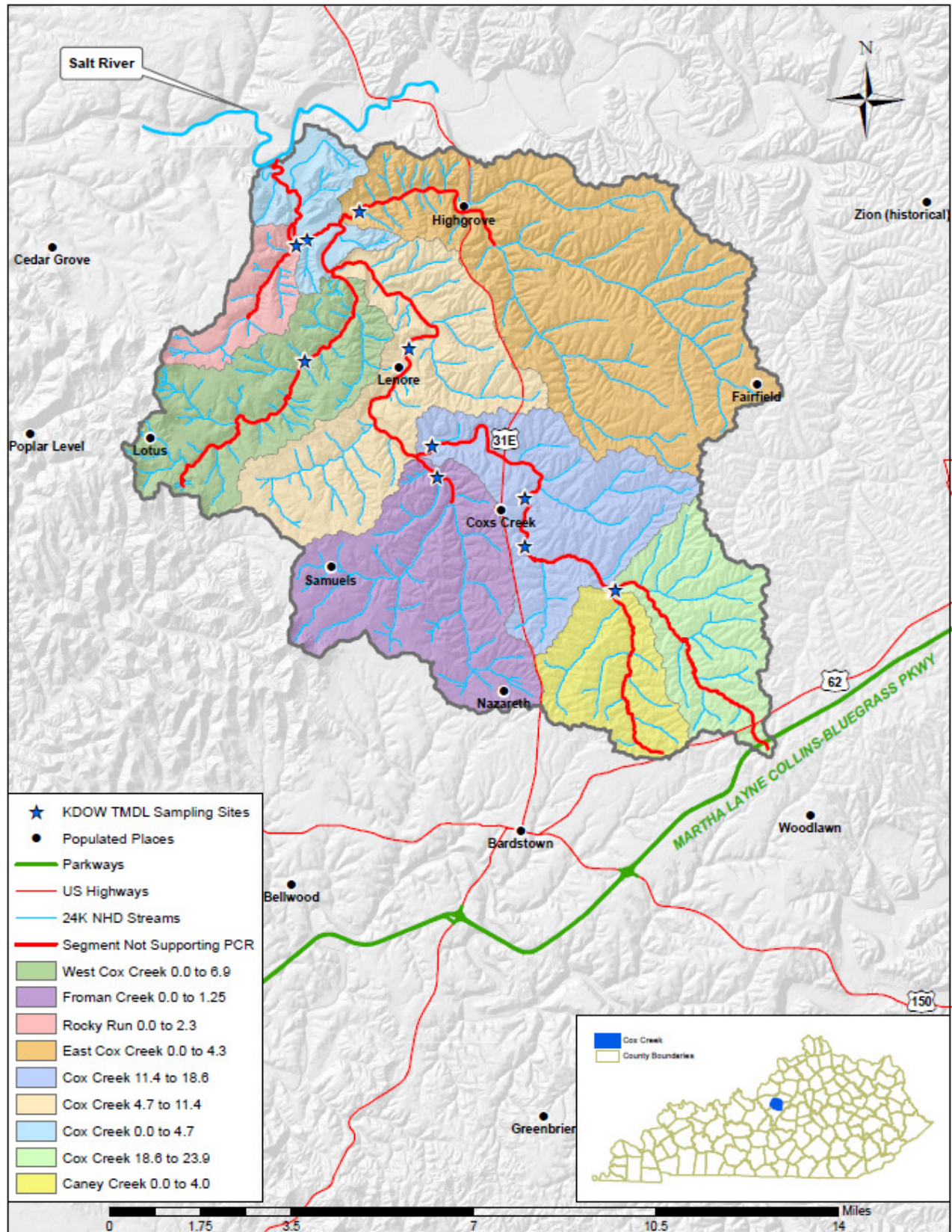


Figure S.1 Location of the Cox Creek Watershed, Sample Sites and Assessed Stream Segments

Total Maximum Daily Load (TMDL) Synopsis

TMDL Equation and Calculations:

A TMDL calculation is performed as follows:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{MOS}$$

(Equation 1)

The WLA has three components:

$$\text{WLA} = \text{SWS-WLA} + \text{MS4-WLA} + \text{Future Growth-WLA}$$

(Equation 2)

Where:

TMDL: the WQC, expressed as a load. The WQC is defined in Section 6.0 as an instantaneous concentration of 240 colonies/100 ml for *E. coli* or 400 colonies/100 ml for fecal coliform.

MOS: the Margin of Safety, which can be an implicit or explicit additional reduction applied to sources of pollutants that accounts for uncertainties in the relationship between effluent limits and water quality.

TMDL Target: the TMDL minus the MOS.

WLA: the Wasteload Allocation, which is the allowable loading of pollutants into the stream from KPDES-permitted sources, such as SWSs and MS4s.

SWS-WLA: the WLA for KPDES-permitted sources, which have discharge limits for pathogen indicators (including wastewater treatment plants, package plants and home units).

Remainder: the TMDL minus the MOS and minus the SWS-WLA (also equal to Future Growth-WLA plus the MS4-WLA and the LA).

Future Growth-WLA: the allowable loading for future KPDES-permitted sources, including new SWSs, expansion of existing SWSs, new storm water sources, and growth of existing storm water sources (such as MS4s). Also includes the allocation for the KPDES-permitted sources that existed but were not known at the time the TMDL was written.

Remainder: the TMDL minus the MOS and minus the SWS-WLA (also equal to Future Growth-WLA plus the MS4-WLA and the LA).

MS4-WLA: the WLA for KPDES-permitted municipal separate storm water sewer systems (including cities, counties, roads and right-of-ways owned by the Kentucky Transportation Cabinet (KYTC), universities and military bases).

LA: the Load Allocation, which is the allowable loading of pollutants into the stream from sources not permitted by KPDES and from natural background.

Seasonality: yearly factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses.

Critical Condition: the time period when the pollutant conditions are expected to be at their worst.

MAF: the Mean Annual Flow as defined by USGS.

Adjusted MAF: the MAF plus SWS-WLA design flows.

Critical Flow: the flow used to calculate the TMDL as a load (is equivalent to the Adjusted MAF for MAF TMDLs)

Existing Conditions: the load that exists in the watershed at the time of TMDL development (i.e., sampling) and is causing the impairment.

Total Maximum Daily Load (TMDL) Synopsis

Percent Reduction: the loading reduction needed to bring the existing condition in line with the TMDL target.

Load: concentration * flow * conversion factor

Concentration: colonies per 100 milliliters (colonies/100ml)

Flow (i.e. stream discharge): cubic feet per second (cfs)

Conversion Factor: the value that converts the product of concentration and flow to load (in units of colonies per day); it is derived from the calculation of the following components: $(28.31685\text{L}/\text{ft}^3 * 86400\text{seconds}/\text{day} * 1000\text{ml}/\text{L}) / (100\text{ml})$ and is equal to 24,465,758.4.

Calculation Procedure:

- 1) The MOS, if an explicit value, is calculated and subtracted from the TMDL first, giving the TMDL Target;
- 2) Percent reductions are calculated to show the difference between Existing Conditions and the TMDL Target;
- 3) The SWS-WLA is calculated and subtracted from the TMDL Target, leaving the Remainder;
- 4) The Future Growth-WLA is calculated and subtracted from the Remainder;
- 5) If there is a MS4 present upstream of the impaired segment, the MS4-WLA is subtracted from the Remainder based on percent land use, leaving the LA.

Translation of WLAs into Permit Limits

All KPDES-permitted sources must meet permit limits based on the Water Quality Criteria (WQC) in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average and 240 colonies/100 ml as a maximum weekly average or as a fecal coliform effluent gross limit of 200 colonies/100 ml as a monthly average and 400 colonies/100 ml as a maximum weekly average.

The MS4-WLA is not a numerical end-of-pipe limit; it is an in-stream allocation. The MS4-WLA will be addressed through the MS4 permit and implemented through the Stormwater Quality Management Plan (SWQMP) to the Maximum Extent Practicable (MEP).

Total Maximum Daily Load (TMDL) Synopsis

Table S.2 TMDLs and Allocations

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA ⁽³⁾	MS4-WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
Cox Creek 0.0 to 4.7 into Salt River						
6.68×10 ¹¹ col/day	6.68×10 ¹⁰ col/day	9.08×10 ⁷ col/day	1.94×10 ⁸ col/day	3.00×10 ⁹ col/day	5.98×10 ¹¹ col/day	113.7
Cox Creek 4.7 to 11.4 into Salt River						
3.38×10 ¹¹ col/day	3.38×10 ¹⁰ col/day	9.08×10 ⁷ col/day	1.82×10 ⁸ col/day	1.52×10 ⁹ col/day	3.02×10 ¹¹ col/day	57.5
Cox Creek 11.4 to 18.6 into Salt River						
1.33×10 ¹¹ col/day	1.33×10 ¹⁰ col/day	9.08×10 ⁷ col/day	5.77×10 ⁷ col/day	6.00×10 ⁸ col/day	1.19×10 ¹¹ col/day	22.7
Cox Creek 18.6 to 23.9 into Salt River						
5.99×10 ¹⁰ col/day	5.99×10 ⁹ col/day	n/a	n/a	2.70×10 ⁸ col/day	5.36×10 ¹⁰ col/day	10.2
Caney Fork 0.0 to 4.0 into Cox Creek						
4.46×10 ¹⁰ col/day	4.46×10 ⁹ col/day	n/a	8.21×10 ⁷ col/day	4.02×10 ⁸ col/day	3.97×10 ¹⁰ col/day	7.6
East Fork Cox Creek 0.0 to 4.3 into Cox Creek						
1.92×10 ¹¹ col/day	1.92×10 ¹⁰ col/day	n/a	n/a	8.64×10 ⁸ col/day	1.73×10 ¹¹ col/day	32.7
Froman Creek 0.0 to 1.25 into Cox Creek						
9.75×10 ¹⁰ col/day	9.75×10 ⁹ col/day	n/a	1.25×10 ⁸ col/day	4.39×10 ⁸ col/day	8.72×10 ¹⁰ col/day	16.6
Rocky Run 0.0 to 2.3 into Cox Creek						
2.29×10 ¹⁰ col/day	2.29×10 ⁹ col/day	n/a	n/a	1.03×10 ⁸ col/day	2.05×10 ¹⁰ col/day	3.9
West Fork Cox Creek 0.0 to 6.9 into Cox Creek						
5.64×10 ¹⁰ col/day	5.64×10 ⁹ col/day	n/a	n/a	2.54×10 ⁸ col/day	5.05×10 ¹⁰ col/day	9.6

Notes:

- (1). TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the mean annual streamflow (MAF) and the appropriate conversion factor. MAF is determined by the USGS. The TMDL is the sum of all components.
- (2). MOS is explicitly set at 10% of the Water Quality Criterion
- (3). Any future KPDES wastewater permitted sources must meet permit limits based on the Water Quality Criterion in 401 KAR 10:031, and must not cause or contribute to an existing impairment. WLA value is based on acute permit limits and design flow and represents the maximum one-day load that can be discharged to the stream segment.

1.0 Introduction

Section 303(d) of the Clean Water Act requires states to identify waterbodies within their boundaries that have been assessed and are not currently meeting their designated uses (401 KAR 10:026 and 10:031) and that require the development of a Total Maximum Daily Load (TMDL). States must establish a priority ranking for such waters, taking into account their intended uses and the severity of the pollutant. Section 303(d) also requires that states provide a list of this information called the 303(d) list. This list is submitted to the Environmental Protection Agency (EPA) during even-numbered years and each submittal replaces the previous list. The 2010-303(d) information for Kentucky can be found in the 2010 *Integrated Report to Congress on the Condition of Water Resources in Kentucky Volume II. 303(d) List of Surface Waters* (Kentucky Division of Water (KDOW) 2010) and can be obtained at: <http://water.ky.gov>.

States are also required to develop TMDLs for the pollutants that cause each waterbody to fail to meet its designated uses. The TMDL process establishes the allowable amount (i.e. “load”) of the pollutant the waterbody can naturally assimilate while continuing to meet the water quality criteria (WQC) for each designated use. The pollutant load must be established at a level necessary to implement the applicable WQC with seasonal variations and a Margin of Safety (MOS) that takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality. This load is then divided among different sources of the pollutant in a watershed. Information from EPA on TMDLs can be found at: <http://www.epa.gov/owow/tmdl>.

This TMDL document provides important bacteria allocations and reductions that could assist with developing detailed watershed plans to guide watershed restoration efforts. Watershed Plans for the bacteria impaired Cox Creek waterbodies should address both KPDES-permitted (point) and non KPDES-permitted (nonpoint) sources of bacteria loadings to the watersheds and should build on existing efforts as well as evaluate new approaches. Comprehensive Watershed Plans should consider both voluntary and regulatory approaches in order to meet water quality standards.

2.0 Problem Definition

The Salt River Basin-Cox Creek, United States Geological Survey (USGS) hydrologic unit code (HUC) 05140102 is located in west central Kentucky east of the intersection of Interstates 65 and 64. The area of interest is in the center of the Salt River basin and is mostly contained in Nelson County though portions of the watershed in the north and east extend into Bullitt and Spencer counties (Figure 2.1).

2.1 303(d) Listing History

Data collected by the Kentucky Department of Fish and Wildlife Resources (KDFWR) was used to first assess Cox Creek, from RM 11.2 to 15.5 in the 2002 Kentucky Report to Congress on Water Quality as partially supporting the aquatic life (i.e. WAH) designated use. This segment was placed on the 303(d) List of Impaired Waters, after it was determined to be impaired by excessive nutrient loading from surrounding cornfields and excessive hog waste applications from adjacent animal feeding operations. Data collected by the KDOW Ambient Monitoring Program was used to first assess Cox Creek, from RM 0.0 to 4.7 in the 2004 Kentucky Report to Congress on Water Quality, as partially supporting the swimming (i.e. PCR) designated use. This segment of Cox Creek was placed on the 303(d) List of Impaired Waters, after it was determined to be impaired by pathogens due to unknown sources. A summary of the original assessment information is listed in Table 2.1.

Table 2.1 Original Assessment Information in the Cox Creek Watershed (2004 Report to Congress on Water Quality)

Waterbody Name	County	GNIS Number	Assessed Use (Support Status)
Cox Creek RM 0.0-4.7	Bullitt	KY490220_01	PCR (partially supporting)
Cox Creek RM 11.2-15.5	Nelson	KY490220_02	WAH (partially supporting)

The KDOW TMDL Section revisited Cox Creek in 2009 to conduct a watershed study. KDOW biologists sampled eleven sites throughout the watershed collecting water chemistry, bacteria and habitat information. Three of the eleven sites were also sampled for aquatic life. As a result of the sampling effort, KDOW proposes adding five tributaries and two more segments of Cox Creek to the 2012 Integrated Report to Congress on Water Quality as impaired for the PCR designated use. The *E. coli* TMDL stream segments addressed in this document are listed in Table 2.2 and illustrated on Figure 2.1.

Data used to assess these waterbodies included *E. coli* data collected by the KDOW TMDL Section. General watershed data, available from the Kentucky Geography Network (i.e., geology, land cover, location of KPDES-permitted sources, etc. <http://kygeonet.ky.gov>) was also analyzed in a geographic information systems (GIS) framework. *E. coli* data are used as an

indicator of the presence of bacteria pollution. Suspected sources of impairment include non-KPDES permitted sources (failing Onsite Sewage Treatment and Disposal Systems (OSTDSs), agriculture, livestock, illegal straight-pipe discharge and rural runoff) as well as KPDES permitted sources (other permitted small flows discharges, urban runoff and sewer infrastructure).

Table 2.2 Impaired Waterbodies within the Cox Creek Watershed (USGS HUC 05140102) Addressed in this TMDL Document

Waterbody Name	Pollutant	County	GNIS Number	Suspected Sources	Impaired Use (Support Status)
Cox Creek 0.0 to 4.7	<i>E. coli</i>	Bullitt	KY490220_01	Nonpoint Sources	PCR (not supporting)
Cox Creek 4.7 to 11.4	<i>E. coli</i>	Nelson	KY490220_02	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)
Cox Creek 11.4 to 18.6	<i>E. coli</i>	Nelson	KY490220_03	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access, Other Permitted Small Dischargers	PCR (not supporting)
Cox Creek 18.6 to 23.9	<i>E. coli</i>	Nelson	KY490220_04	Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers	PCR (not supporting)
Caney Fork 0.0 to 4.0	<i>E. coli</i>	Nelson	KY488864_01	Nonpoint Sources, Agriculture, Unrestricted Cattle Access, Urban Runoff/ Storm Sewers	PCR (not supporting)
East Fork Cox Creek 0.0 to 4.3	<i>E. coli</i>	Bullitt	KY491454_01	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)
Froman Creek 0.0 to 1.25	<i>E. coli</i>	Nelson	KY492574_01	Nonpoint Sources, Agriculture, Unrestricted Cattle Access	PCR (not supporting)
Rocky Run 0.0 to 2.3	<i>E. coli</i>	Bullitt	KY502264_01	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)

Waterbody Name	Pollutant	County	GNIS Number	Suspected Sources	Impaired Use (Support Status)
West Fork Cox Creek 0.0 to 6.9	<i>E. coli</i>	Bullitt	KY506428_01	Nonpoint Sources Animal Feeding Operations (NPS), Agriculture, Unrestricted Cattle Access	PCR (not supporting)

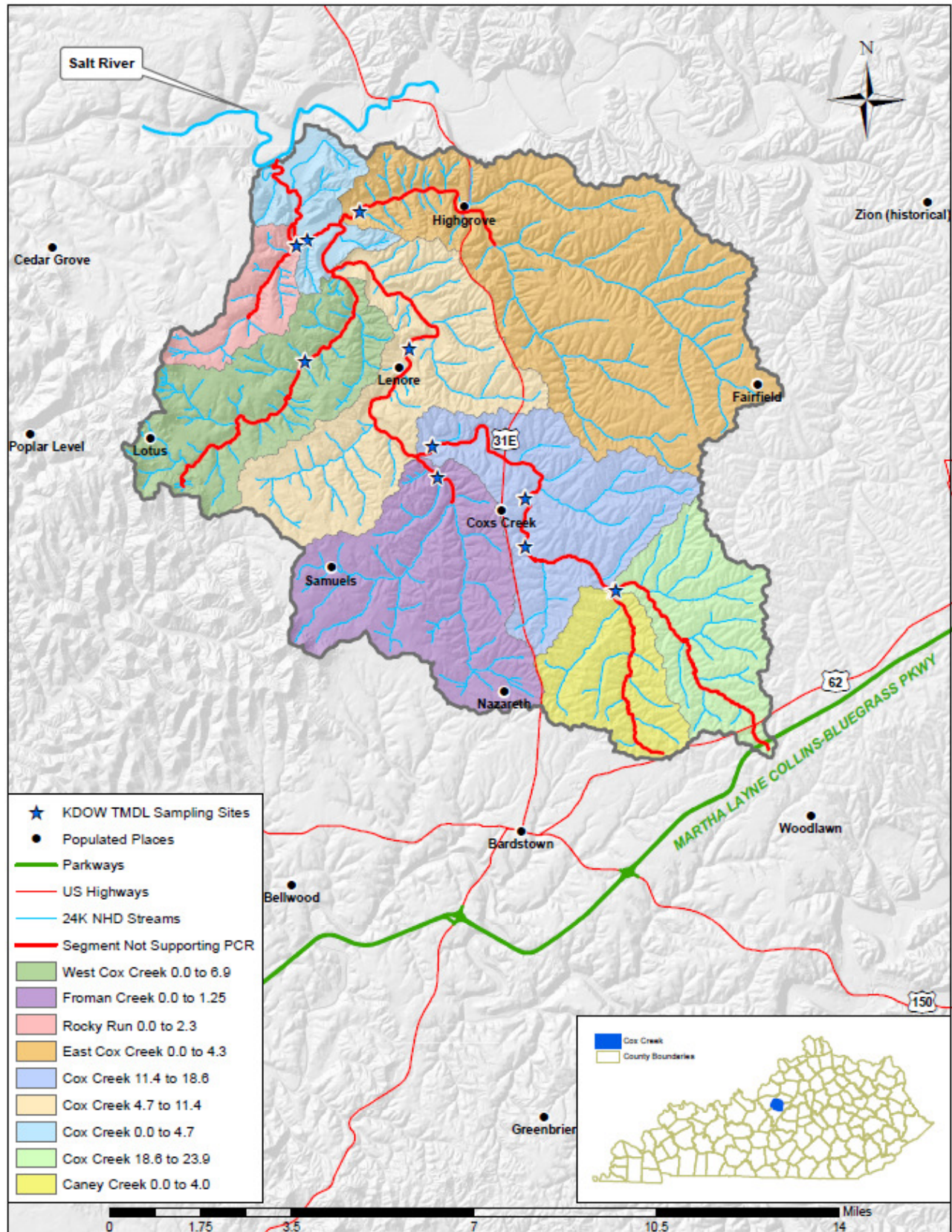


Figure 2.1 Cox Creek Watershed Location in Relation to the City of Bardstown, KY

3.0 Physical Setting

The Cox Creek watershed is located approximately two miles north of the city of Bardstown. The stream generally flows north draining five tributaries (Caney, Froman, East Cox and West Cox Creeks and Rocky Run) before emptying into the Salt River near the community of Solitude, Kentucky.

3.1 Geology

Cox Creek lies within the Outer Bluegrass physiographic region of the Interior Plateau Level III ecoregion (Woods et al 2002). The watershed is located along the boundary of the Outer Bluegrass and Knobs physiographic regions but is primarily in the Outer Bluegrass - the Outer Bluegrass is associated with the upper Ordovician period while the Knobs is associated with the Devonian, Silurian and Mississippian periods (Figure 3.1). Major formations in the area include the Drakes (a fossiliferous limestone, dolomite and shale) and Grant Lake Limestone (an interbedded fossiliferous limestone and shale) from the upper Ordovician period – these formations encompass approximately 2/3 of the watershed that lie in the Outer Bluegrass. Portions of the Laurel dolomite from the middle Silurian and New Albany Shale (an organic-rich black shale) from the Devonian period outcrop on the western side of the watershed that lie more in the Knobs physiographic region. These types of bedrock have shallow soils, carry moderate to severe limitations for septic system installation and have locally fast drainage through fractures and sinks to the water table, creating a greater potential for groundwater contamination. Those living in the western area of the watershed should consider the phenomenon of swelling shales, where this rock layer and/or soils derived from it may swell when exposed to water or oxygen (KGS 2006).

The major soil types in Cox Creek are various types of clayey residuum, mixed fine-silty alluvium and thin fine-silty loess. The major soil series present include the Beasley, Fairmount, Faywood and Lowell (USDA-NRCS, SSURGO database 2008).

Some areas of the watershed are prone or sensitive to karst features such as sinkholes, sinking streams and springs (see Figure 3.2). Official watershed boundaries may not be accurate in well-developed karst regions. Although groundwater drainage generally follows topographic basin boundaries, this is not always true in karst areas. Subsurface drainage transfer between surface watersheds in a karst region does occur, which increases or decreases the actual boundaries of an affected stream basin. This can also influence monitoring station selection when a spring draining a significant portion of the watershed is located in an adjacent basin. The KDOW and the KGS maintain a Karst Atlas of groundwater tracing data and delineated karst groundwater basins (both as static PDF maps and GIS files) that can be downloaded at <http://kygeonet.ky.gov>. These data should be consulted to determine if karst groundwater flow deviation is present. This work is ongoing and data is updated as information becomes available (Blair 2008).

Karst terrane can create geological hazards such as sudden surface collapse (due to sinkholes), flooding (if a karst pathway becomes clogged with debris or overloaded due to improper surface flow routing), and soil erosion. Karst aquifers are especially sensitive to contamination. Areas underlain by karst hydrology can have rapid groundwater flow rates, with complex routes. Storm water and associated pollutants can enter stream sinks and sinkholes with little or no

filtration or attenuation of the contaminants. Groundwater velocities within conduits are commonly measured in thousands of feet per day instead of the typical rate of inches or feet per year in non-karst systems – the maximum recorded conduit groundwater velocity in Kentucky exceeds 2600 feet per hour (Blair 2008).

Karst pathways serve as underground tributaries to surface water, and thus may become a transport pathway for pollutants to streams. Due to the dendritic pattern of karst drainage, nonpoint source pollutants from a large area can coalesce and be focused at a single spring. Conversely, some karst systems may have a radial drainage pattern from a topographic high and disperse point source pollution over a broad area. Improper waste management activities (e.g. dumping into sinkholes, poorly installed or failing OSTDs) or improper best management practices (e.g. lack of buffer strips around sinkholes and sinking streams in agricultural fields) can lead to direct contamination of water supplies. Karst also provides a challenge for nonpoint source pollution management as its pathways have long been regarded as “nature’s sewer system” – sinkhole plains, sinking streams, and springs provide a direct connection between surface water and groundwater systems

3.2 Hydrology

Cox Creek originates in northeastern Bardstown and flows in a northwesterly direction for 23.9 miles. The fifth order stream drains an area of 101.95 square miles, or 65,128 acres before entering the Salt River near River Mile (RM) 34.7; the Salt River by and large flows west/northwest before discharging into the Ohio River in West Point, Kentucky. Cox Creek drops about 400 feet in elevation from its origin to the mouth.

3.3 Land Cover Distribution

The watershed area of Cox Creek is approximately 65,128 acres. Land cover is largely agricultural pasture land (46.44%) followed by forest (37.17%). In 2001, only 3.73% of the total land area was developed and mostly located along rural roads and small towns (including Bardstown, Cox Creek, Lotus and High Grove). The 2001 National Land Cover Dataset (NLCD) overlain with individual USGS Stream Reach Drainage Polygons within a GIS framework was used to determine land cover areas in the watersheds. Table 3.1 summarizes the land cover by percentage and acres within the watershed and Figure 3.3 provides a visual demonstration. Individual land cover maps from each sample site to the headwaters are included in Section 8. Further discussion of land cover classifications is found in Appendix A.

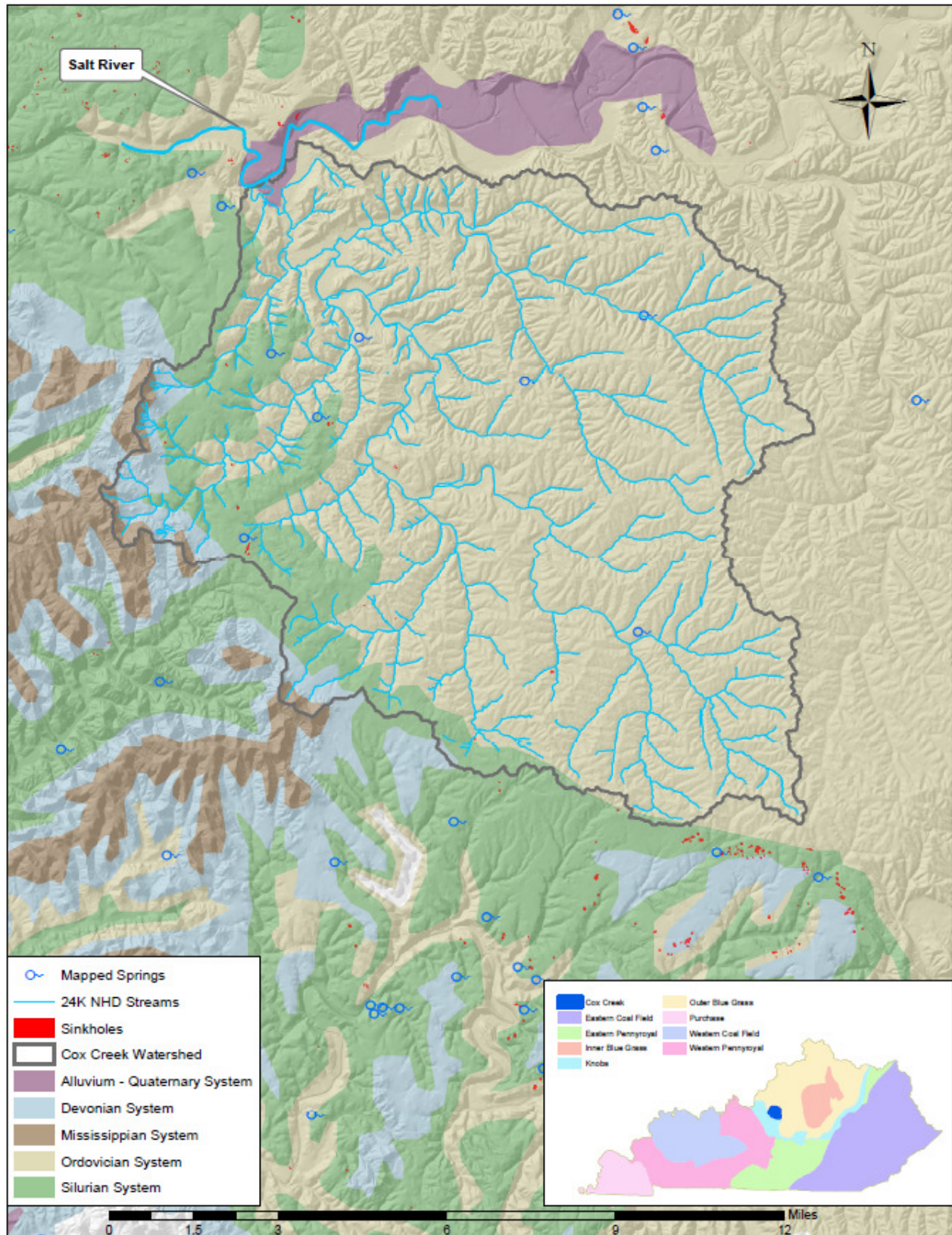


Figure 3.1 Simplified Geologic Map of the Cox Creek Watershed

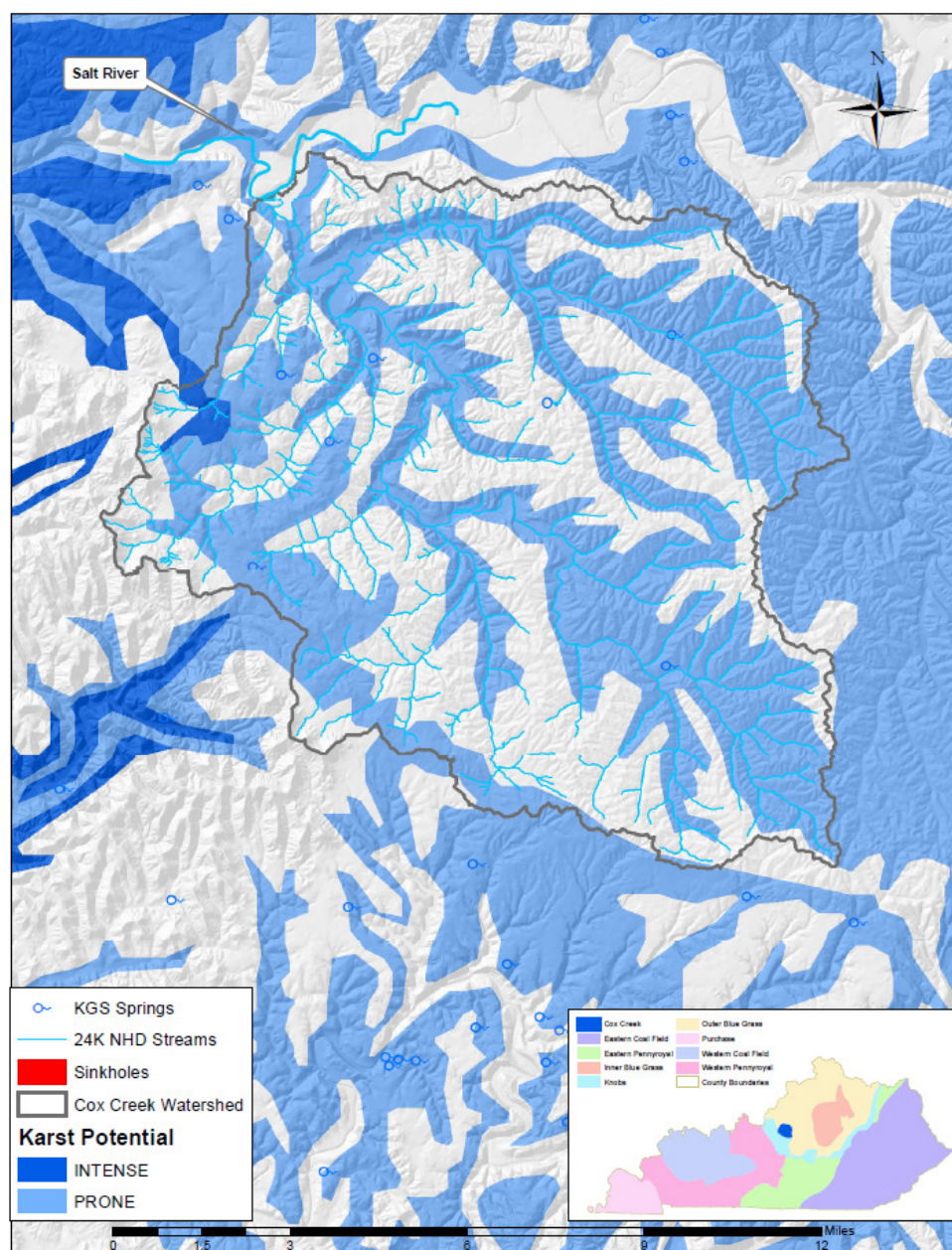


Figure 3.2 Karst Potential within the Cox Creek Watershed.

Table 3.1 Summary of Land Cover within the Cox Creek Watershed

Land Use	% of Total Area	Acres
Forest	37.17%	24,206.90
Agriculture (total)	55.65%	36,241.46
Pasture	46.44%	30,244.06
Row Crop	9.21%	5,997.40
Developed	3.73%	2,431.47
Natural Grassland	2.35%	1,528.87
Wetland	0.48%	312.60
Barren	0.10%	65.42

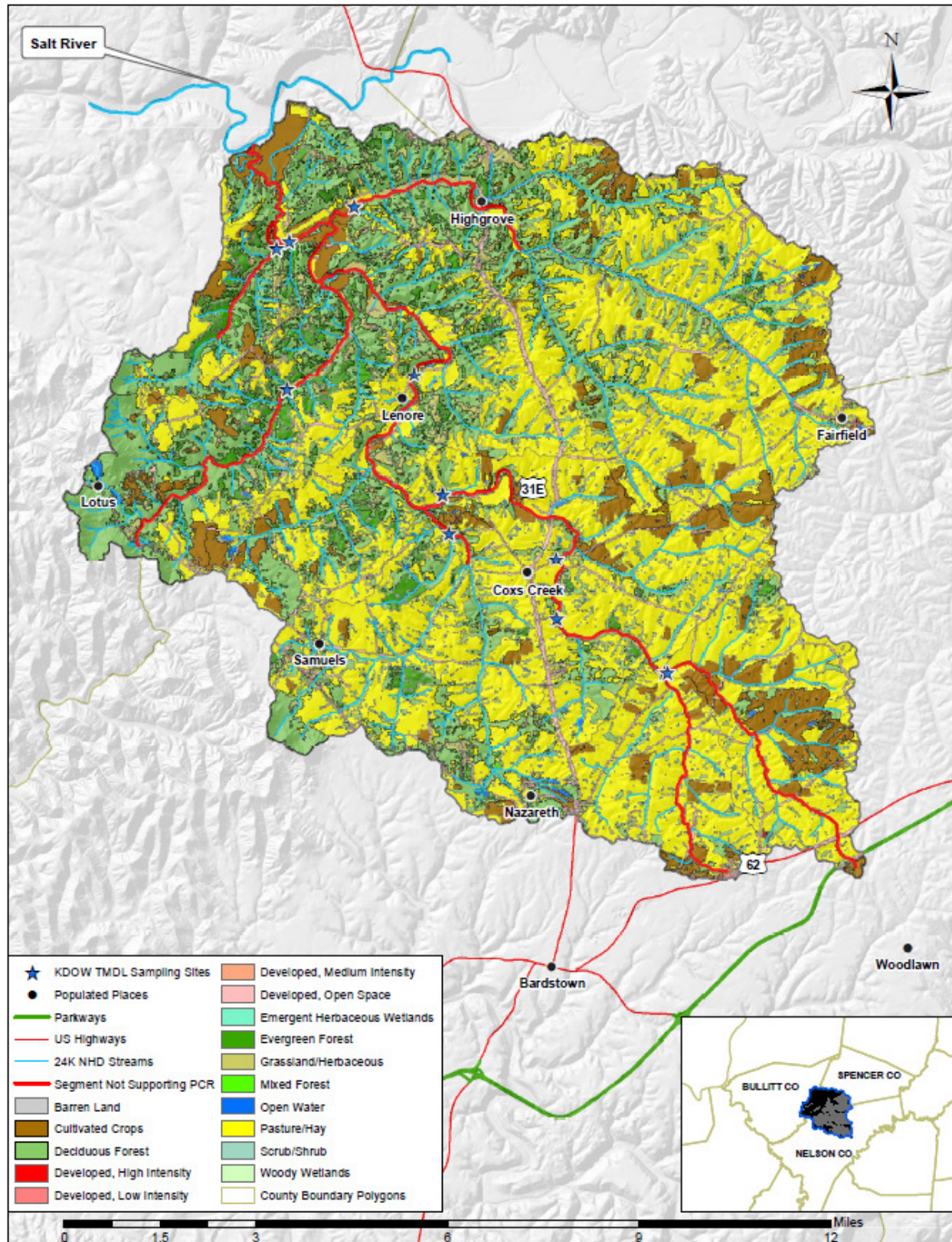


Figure 3.3 Land Cover within the Cox Creek Watershed (MRLC NLCD 2001)

4.0 Monitoring

KDOW first assessed a headwater segment of Cox Creek in the 2002 Kentucky Report to Congress on Water Quality, as partially supporting the aquatic life designated use; a segment at the mouth of the watershed was assessed in the 2004 Kentucky Report to Congress on Water Quality, as partially supporting the swimming designated use. Cox Creek was placed on the 303(d) List of Impaired Waters, after it was determined to be impaired by pathogens and excessive nutrient loading (KDOW 2002 & 2004).

4.1 KDOW TMDL Monitoring

The TMDL Section of the KDOW monitored eleven sites within the Cox Creek watershed from November 2008 – October 2009. *E. coli* and water quality parameters were collected at all sites in the watershed (Table 4.1, Figure 4.1). Nutrients TMDL nutrient parameters were collected at five of the eleven sites approximately once a month, while *E. coli* samples were collected during twelve sampling events spanning the Primary Contact Recreation (PCR) season months of May through October. Biological sampling was conducted at three sites (CFD12005502, DOW12005009 and DOW12005010). During these sampling events macroinvertebrates, algae and water chemistry were collected, and a habitat assessment and discharge measurements were completed; all sites resulted in a ranking of poor using the macroinvertebrate biotic index. Data related to riparian zone and available cover was also collected at seven of the eleven sites. Figure 4.1 shows the assessed stream segments and sampling sites where data were collected for the TMDL. Table 4.2 presents a statistical summary of the *E. coli* data.

4.1.1 KDOW TMDL Watershed Health Reports

The KDOW TMDL Section has developed a public communication tool, called a Health Report, to share the results of their year long monitoring studies with public and local government officials. The Health Report reports on the water quality and biological health of the watershed and highlights what is doing well and what needs improvement. It also highlights what can be done to help improve water quality and encourages public awareness and participation. The Cox Creek Health Report Card is presented in Table 4.3; the full Health Report can be found in Appendix B or at the following website, <http://water.ky.gov/waterquality/Pages/SaltRiverHealthReports.aspx>.









Table 4.1 KDOW TMDL Sample Locations and Parameters Collected Within the Cox Creek Watershed (11/2008 thru 10/2009)

Station Name and ID	Latitude	Longitude	River Mile	Stream Segment	Parameters Collected
Cox Creek Off Cedar Grove Rd. DOW12005002	37.97411	-85.54158	2.6	Cox Creek 0.0 to 4.7	E. coli; discharge; multiparameter meter
Rocky Run At Cedar Grove Rd. bridge DOW12005003	37.97262	-85.54530	0.5	Rocky Run 0.0 to 2.3	E. coli; discharge; multiparameter meter
East Fork Cox Creek At Grigsby Lane bridge CFD12005501	37.98198	-85.52298	0.6	East Fork Cox Creek 0.0 to 4.3	E. coli; discharge; multiparameter meter
West Fork Cox Creek At Lutz Lane bridge DOW12005004	37.94043	-85.54237	4.4	West Fork Cox Creek 0.0 to 6.9	E. coli; discharge; multiparameter meter
Cox Creek At SR523 (Deatsville Rd.) bridge DOW12005005	37.94391	-85.50580	8.3	Cox Creek 4.7 to 11.4	E. coli; discharge; multiparameter meter
Cox Creek At Lenore Rd. bridge (SR2739) CFD12005502	37.91674	-85.49780	11.8	Cox Creek 11.4 to 18.6	NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter
Froman Creek At Mobley Mill Rd. bridge DOW12005006	37.90798	-85.49598	0.55	Froman Creek 0.0 to 1.25	E. coli; discharge; multiparameter meter
Cox Creek Above SR509 bridge; below package plant outfall DOW12005007	37.90202	-85.46521	15.4	Cox Creek 11.4 to 18.6	NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter
Cox Creek Off Wheeler-Wright Ln.; above school DOW12005008	37.88845	-85.46516	16.55	Cox Creek 11.4 to 18.6	NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter
Caney Fork Off Murray Run Rd. DOW12005009	37.87607	-85.43433	0.05	Caney Fork 0.0 to 4.0	NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter
Cox Creek Off Murray Run Rd. DOW12005010	37.87615	-85.43354	18.75	Cox Creek 18.6 to 23.9	NO2/NO3; NH3-N; TKN; Total P; Ortho-P; TOC; BOD5; E. coli; discharge; multiparameter meter

Table 4.2 Statistical Summary of *E. coli* Data Collected in the Cox Creek Watershed during the 2011 PCR Season

Station Name	Number of Observations	% Exceeding Instantaneous WQC (240 colonies/100ml)	Minimum (colonies/100mL)	Maximum (colonies/100mL)	Average (colonies/100mL)
DOW12005002	11	81.8	147	24190	>3360.6
DOW12005003	10	90.0	79	>2419	785.4
CFD12005501	12	83.3	166	>2419	>1406.5
DOW12005004	10	80.0	106	>2419	>892.5
DOW12005005	11	90.9	25	>2419	>931.1
CFD12005502	10	70.0	12	>2419	>1179.3
DOW12005006	10	70.0	20	>2419	>721.5
DOW12005007	10	80.0	117	>2419	>1471.8
DOW12005008	9	77.8	147	>2419	>2056.9
DOW12005009	10	90.0	236	>24190	>3566.4
DOW12005010	10	100.0	285	>24190	>4899.1

Table 4.3 Cox Creek Watershed Health Report from the 2009 TMDL Watershed Study

Site ID	Stream									Site
DOW12005002	Cox Creek	B+	B+		F			D	F	D
DOW12005003	Rocky Run	A	C		F					C
CFD12005501	East Fork Cox Creek	B	B+		F			B	D	C
DOW12005004	West Fork Cox Creek	A	C		F			D	C	C-
DOW12005005	Cox Creek	D	B		F			D	D	D
CFD12005502	Cox Creek	C	B	C-	D	F	F	D	D	D
DOW12005006	Froman Creek	F+	B		D					C-
DOW12005007	Cox Creek	C	B	C-	F					C-
DOW12005008	Cox Creek	B	B	C-	D					C
DOW12005009	Caney Fork	C	B	C	F	D	F	C	F	D+
DOW12005010	Cox Creek	D+	B	C-	F	F	D	D	D	D

Notes:

Signs of water quality and biological health from left to right are: Dissolved Oxygen, Specific Conductivity, Nitrogen & Phosphorous, *E. coli*, Aquatic Macroinvertebrates, Total Habitat, Riparian Zone and Available Cover. See Appendix B for the complete Cox Creek Watershed Health Report.

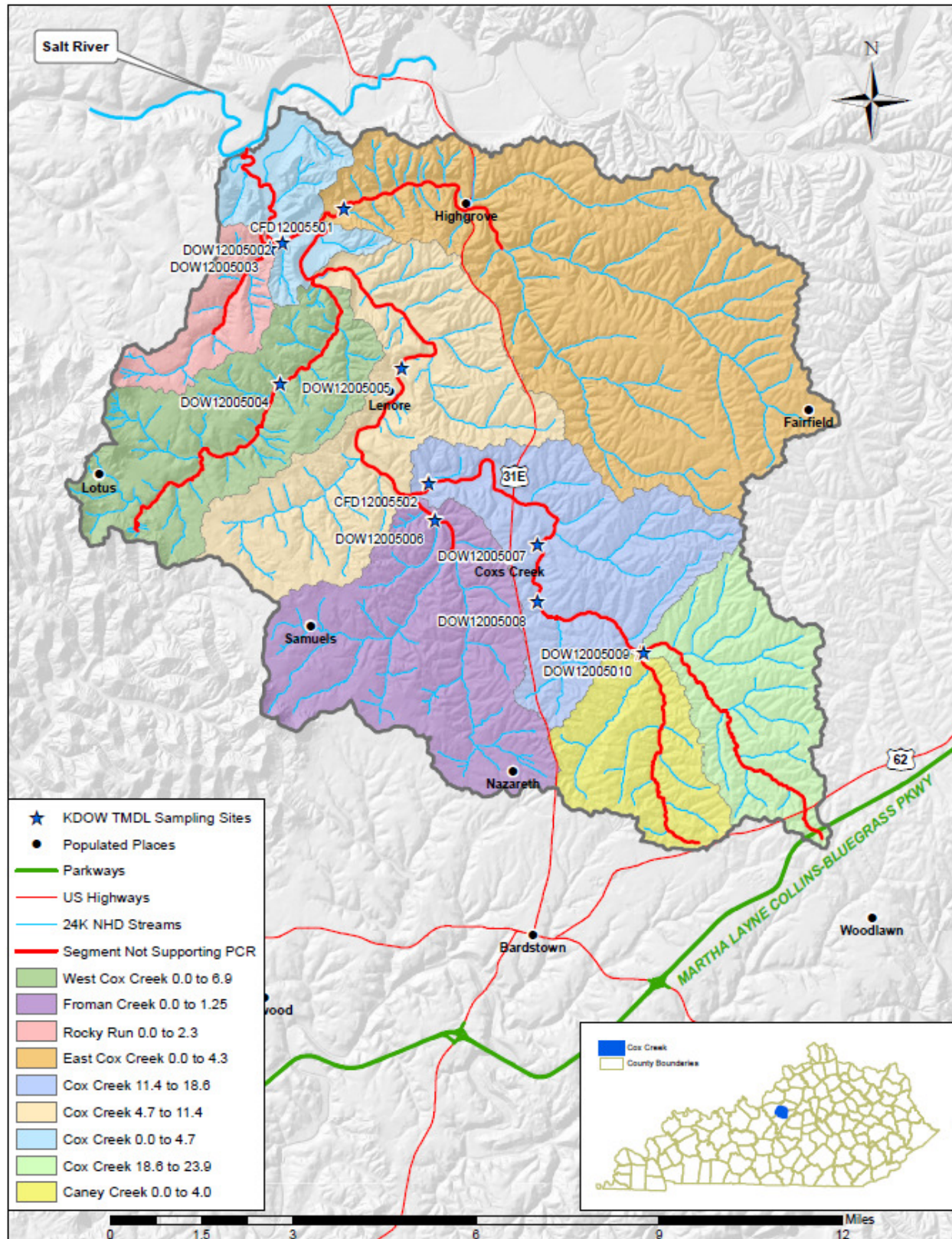


Figure 4.1 Locations of KDOW Sample Sites and Assessed Stream Segments within the Cox Creek Watershed

5.0 Source Identification

For regulatory purposes, the sources of fecal coliform and *E. coli* in a watershed can be placed into two categories: KPDES-permitted and non KPDES-permitted sources. A KPDES-permitted source requires a Kentucky Pollutant Discharge Elimination System (KPDES) discharge permit, a storm water permit, or a Municipal Separate Storm Sewer System (MS4) permit from the KDOW. KPDES discharge permits include wastewater treatment facilities that discharge directly to a stream, facilities discharging storm water, and some agricultural operations (e.g. Concentrated Animal Feeding Operations (CAFOs) with an individual discharge permit). KPDES is not the only permitting program that may affect water quality or quantity within a watershed; other permitting examples include water withdrawal permits, permits to build structures within a floodplain, permits to construct an on-site sewage treatment disposal system (OSTDS), and permits to land apply waste from sewage treatment plants. However, within the framework of the TMDL process a KPDES-permitted source is defined as one regulated under the KPDES program.

Non KPDES-permitted sources include nonpoint sources of pollution. Nonpoint sources of pollution are often caused by runoff from precipitation over and/or through the ground and are correlated to land use.

5.1 KPDES-permitted Sources

KPDES- permitted sources include all sources regulated by the KPDES permitting program. KPDES permit and point source are defined in 401 KAR 10:001. A Wasteload Allocation (WLA) is assigned to KPDES-permitted sources.

5.1.1 Sanitary Wastewater Systems

Sanitary Wastewater Systems (SWSs) include all facilities with a design flow which are permitted to discharge fecal coliform or *E. coli*. This includes Wastewater Treatment Plants (WWTPs), Sewage Treatment Plants (STPs), package plants and home units. Information obtained from the Water Resource Information System (WRIS, <http://kia.ky.gov/wris/>), KDOW Surface Water Permits Branch, and Water Infrastructure Branch was used to confirm information associated with wastewater facilities in the watershed as well as acquire background information and any future planned expansions. In addition, in October 1999 and March 2000 the Lincoln Trail Area Development District (LTADD) wrote a “Summary of Wastewater Treatment Systems” as part of the “Strategic Water Resource Development Plan” (SWRDP) compiled and released by the Water Resource Development Commission of the Governor’s Office. Information from this report is for informative purposes only. There is currently one KPDES wastewater facility discharging to a bacteria-impaired segment in the watershed. Figure 5.1 shows the location of all KPDES-permitted sources within the Cox Creek watershed and Table 5.1 provides a summary of permit information. Appendix C contains DMR information from the last five years for Cox’s Creek Elementary School.

Cox’s Creek Elementary School (KY0096075) operates a small sewage treatment system for their students and employees at 5635 Louisville Road in Bardstown, KY. The package treatment plant has a design capacity of 0.01 MGD and discharges directly to Cox’s Creek. According to

DMR data submitted to KDOW in the last five years, the facility has exceeded their permit limits for ammonia nitrogen and total phosphorous a few times but has never exceeded their bacteria limits. The facility also has failed to submit many of their DMRs in a timely manner. See Section 5.1.1.2 for proposed sewer expansions to this facility.

Table 5.1 Summary of KPDES-permitted Source Information

KPDES Permit Number	Facility	Flow (cfs)⁽¹⁾	Permit Limit Monthly Average (<i>E. coli</i> colonies/ 100 ml)	Permit Limit Maximum Weekly Average (<i>E. coli</i> colonies/ 100 ml)	Outfall Latitude And Longitude	WLA (colonies/ day)	TEMPO AI⁽²⁾
KY0096075	Cox's Creek Elementary School	0.015472	130	240	37.89694 -85.46861	9.08E+07	3250

Notes:

- (1). Flow value is based on design flow.
- (2). The TEMPO AI is an internal KDOW tracking number.

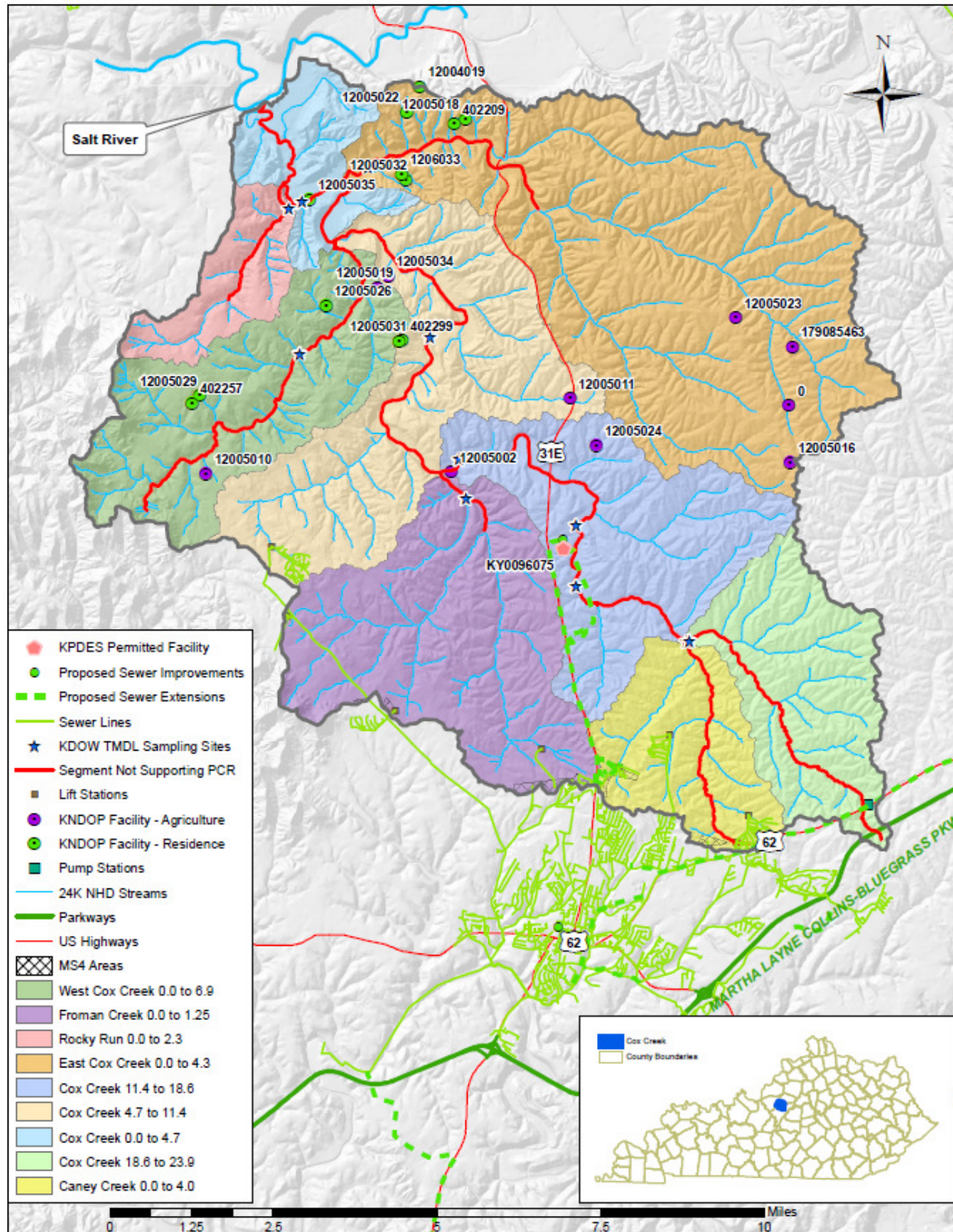


Figure 5.1 Location of KPDES-Permitted Sources, KNDOPs and Wastewater Infrastructure within the Cox Creek Watershed

5.1.1.1 Wastewater Infrastructure

There are two permitted wastewater systems that have sanitary sewer collection infrastructure within the Cox Creek watershed but do not discharge to any of its waters. The city of Bardstown operates a sanitary sewer collection system and six lift stations within upper Cox, Froman and Caney Creeks. This wastewater is treated at the Bardstown Wastewater Treatment Plant. The city of Bloomfield, located less than five miles to the east, operates one pump station in the headwaters of Cox Creek. Wastewater from this station is treated at the Bloomfield Sewage Treatment Plant. System, lift station and/or pump station malfunction as well as system overflow during periods of power outages or high precipitation are potential sources of bacteria in the watershed.

5.1.1.2 Wastewater Upgrades and Expansions

The WRIS has been developed through the cooperative efforts of water and wastewater treatment systems and local, regional, and state agencies. It is used by all of these entities, and provides much of the information needed for all aspects of water resource planning--from watershed protection to infrastructure development. This system was used to obtain more detailed information on wastewater systems and any planned upgrades or expansions. Full project profile and system reports can be found in Appendix D.

Sewer lines cover a very small portion of the Cox Creek watershed (Figure 5.1) however there are a few planned upgrades and expansions in the same area of the current infrastructure. The two systems mentioned above have several projects on the Clean Water State Revolving Fund List. These projects include sewer line extensions and pump station upgrade and construction. One of these projects involves extending the Bardstown sanitary sewer collection system to Cox Creek Elementary school and eliminating its 'inadequate package treatment plant'. These projects, once fully funded, could help reduce the potential sources of bacteria in the watershed.

As discussed in the "*Strategic Water Resource Development Plan*", portions of Cox Creek, especially to the north, are located in rural areas outside of the sewer service areas of Bardstown, Bloomfield, Mount Washington and Taylorsville. Though there are planned expansions and upgrades to the south, there are no plans to extend sewer service to the northern half of the watershed. Areas not included in these projects may be deemed impractical to extend sewer service due to the unusually high cost per potential customer that must be incurred to finance such expansive sewer system development. Reasons for the high cost are the number of households, a low customer per mile ratio, rugged terrain and the long distance from these houses to treatment facilities and existing sewer systems (KIA 2000).

5.1.2 MS4 Sources

In developed areas, polluted stormwater runoff is often diverted and concentrated into MS4s, where it ultimately discharges to surface waters with little or no treatment.

MS4s are defined in 401 KAR 5:002. EPA has categorized MS4s into three categories: small, medium, and large. The medium and large categories are regulated under the Phase I Storm

Water program. Large systems, such as the cities of Lexington and Louisville, have populations in excess of 250,000. Medium systems have populations in excess of 100,000 but less than 250,000; however, there are currently no medium-sized systems in Kentucky. Phase I systems have five-year permitting cycles and have annual reporting requirements. The small MS4 category includes all MS4s not covered under Phase I. Since this category covers a large number of systems, only a select group are regulated under the Phase II rule, either being automatically included based on population (i.e., having a total population over 10,000 or a population per square mile in excess of 1000) or on a case-by-case basis due to the potential to cause adverse impact on surface water. Water quality monitoring is not a requirement of Phase II MS4s, unless the waterbody has an approved TMDL and the MS4 causes or contributes to the impairment for which the TMDL was written (KDOW 2009). A WLA is assigned to all MS4 permits, including the KYTC, universities and military bases.

A small area of the city of Bardstown's MS4 community (KYG200037) clips the southwest portion of the watershed accounting for less than 0.05% of the total watershed area. The Kentucky Transportation Cabinet also has a MS4 permit (KYS000003) and is responsible for stormwater from the pavement and right of way of interstates, parkways, U.S. highways, and state routes within these MS4 boundaries. MS4 permit requirements include development of "a stormwater quality management program that is designed to reduce the discharge of pollutants to the maximum extent practicable (MEP). The MEP standard involves applying best management practices that are effective in reducing the discharge of pollutants in stormwater runoff. This requires that the permittee use known, available, and reasonable methods of prevention and control of stormwater discharges." The MS4 community boundaries are illustrated in Figure 5.1.

5.1.3 Combined Animal Feeding Operations

Operations that are defined as a CAFO pursuant to 401 KAR 5:002 are required to obtain a KPDES permit. Once defined as a CAFO, the operation can be permitted under a KPDES General Permit or a KPDES Individual Permit depending upon the nature of the operation. Conditions of both types of permits include no discharge to surface waters; however, holders of a KPDES Individual Permit may discharge to surface waters during a 25-year (24-hour) or greater storm event.

There is one CAFO in the Cox Creek Watershed, the IPKY Hog Farm (#12005002) located toward the bottom of the Cox Creek 11.4 to 18.6 impaired segment.

5.2 Non KPDES-permitted Sources

Non KPDES-permitted sources include all sources not permitted by the KPDES permitting program and are often associated with land use. The loads to surface water from non-KPDES permitted sources are regulated by laws such as the Kentucky Agricultural Water Quality Act (AWQA, KRS 224.71-100 through 224.71-145, i.e., implementation of individual agriculture water quality plans and corrective measures), the federal Clean Water Act (i.e., the TMDL process) and 401 KAR 5:037 (Groundwater Protection Plans (GPPs)), among others. A Load Allocation (LA) is assigned to non KPDES-permitted sources.

Unlike KPDES-permitted sources, non KPDES-permitted sources typically discharge pollutants to surface water in response to rain events (MS4s are a notable exception, as they are a KPDES-permitted source that discharges to surface water in response to rain events through a system of storm drains, curbs, gutters, etc.). Non KPDES-permitted sources for bacteria exist in the watershed and fall into various categories including agriculture, properly functioning OSTDS, failing OSTDS, household pets and natural background, which in the case of bacteria in a rural watershed means wildlife. Straight-pipes are a type of illegal, non KPDES-permitted source that may exist in the watershed, but none are known to exist with certainty.

As mentioned in Section 3, this watershed is located in a karst region. The KGS has developed Generalized Geologic Maps for Land-Use Planning (<http://www.uky.edu/KGS/>) for every county of the State to inform individuals of the general geologic bedrock condition that can affect a site and its intended uses. For example, this watershed is underlain with mostly limestone bedrock – according to the planning guidance, this type of rock carries severe limitations for septic tank disposal systems depending on the amount of soil cover and depth to bedrock. A severe limitation is defined as one that is “difficult to overcome and commonly is not feasible because of the expense involved.”

5.2.1 Kentucky No Discharge Operational Permits

As stated in 401 KAR 5:005, facilities with agricultural waste handling systems or that dispose of their effluent by spray irrigation but do not discharge to surface waters are required to obtain a Kentucky No Discharge Operational Permit (KNDOP) from the KDOW prior to construction and operation. Animal Feeding Operations (AFOs) receive KNDOP permits. These operations handle liquid waste in a storage component of the operation (e.g. lagoon, pit, or tank) and may land apply the waste via spray irrigation or injection to cropped acreages. Land application of the waste that results in runoff to a stream is prohibited. Facilities that handle animal waste as a liquid are required to submit a Short Form B, construction plans, and a Comprehensive Nutrient Management Plan to the KDOW. Also included in KNDOP requirements are golf courses that land apply treated wastewater via spray irrigation, typically from a holding pond - some industrial operations also spray-irrigate.

There are twelve individual residence KNDOPs in the watershed (see Figure 5.1), mostly located in East and West Cox Creeks. Per discussion with the Surface Water Permits Branch of the KDOW, these residences operate a home unit that are not designed to discharge and are connected to a spray irrigation system. They are regulated under KNDOP provisions not KPDES; their permit information is summarized in Table 5.2.

There are ten agricultural KNDOPs in the Cox Creek watershed, the location of these facilities is depicted on Figure 5.1 and their permit information is summarized in Table 5.2.

Table 5.2 KNDOP Permitted Facilities in the Cox Creek Watershed

KNDOP Number	Facility	KNDOP Type	Latitude	Longitude	TEMPO AI
12005029*	Home Unit	Individual Residence	37.931111	-85.570278	15958
KYG402299	Home Unit	Individual Residence	37.943333	-85.513611	11829
KYG402257	Home Unit	Individual Residence	37.929444	-85.5725	10072
12005022*	Home Unit	Individual Residence	37.994167	-85.512222	10078
12005018*	Home Unit	Individual Residence	37.9925	-85.495833	10080
12005026*	Home Unit	Individual Residence	37.9511	-85.5349	9486
12004019*	Home Unit	Individual Residence	37.999694	-85.508528	70996
12005032*	Home Unit	Individual Residence	37.979167	-85.5125	75062
12005035*	Home Unit	Individual Residence	37.974722	-85.539389	97045
12005031*	Home Unit	Individual Residence	37.943056	-85.514444	71055
1206033*	Home Unit	Individual Residence	37.980278	-85.513611	75137
KYG402209	Home Unit	Individual Residence	37.991424	-85.498934	10079
179085463	Oliver Rogers Dairy Farm	Cattle Ranching & Farming	37.941528	-85.404389	85463
12005023	Lutz Dairy Farm	Dairy Farming	37.948056	-85.420278	10703
12005010	Ulrich Dairy Farm	Dairy Farming	37.913611	-85.568611	10740
12005016	John McClaskey Dairy Farm	Dairy Farming	37.915833	-85.405278	10769
In review	Robert Lutz Dairy Farm	Dairy Farming	37.928489	-85.405411	82013
12005024	Wright Hog Farm	Hog & Pig Farming	37.919722	-85.459444	10714
12005011	Chris Hurst Hog Farm	Hog & Pig Farming	37.930278	-85.466667	10735
12005002	Ipky Hog Farm 1 & 2	Hog & Pig Farming	37.913889	-85.5	10744
12005019	Robinson Hog Farm	Hog & Pig Farming	37.955	-85.520554	10763
12005034	Bob Robinson Hog Farm	Hog & Pig Farming	37.9575	-85.5175	44111

Notes:

* All KNDOPs classified as home units are being migrated to KYG4 permit numbers for tracking purposes. Some permits have already been migrated, as seen in the table above; others will follow in the coming year.

5.2.2 Agriculture

The Kentucky AWQA was passed by the 1994 General Assembly. The law focuses on the protection of surface water and groundwater resources from agricultural and silvicultural activities. The Act created the Kentucky Agriculture Water Quality Authority (KAWQA), a 15-member peer group comprising farmers and representatives from various agencies and organizations. The Act requires farms greater than 10 acres in size to adhere to the Best Management Practices (BMPs) specified in the Kentucky Agriculture Water Quality Plan. Specific BMPs have been designated for all operations. More information on the Kentucky AWQA and Water Quality Plans can be found at <http://conservation.ky.gov/Pages/AgricultureWaterQuality.aspx>.

The USDA National Agricultural Statistics Service (NASS) compiles Census of Agriculture data by County for virtually every facet of U.S. agriculture (USDA 2009). The “Census of Agriculture Act of 1997” (Title 7, United States Code, Section 2204g) directs the Secretary of Agriculture to conduct a census of agriculture on a 5-year cycle collecting data for the years ending in 2 and 7. Selected agricultural data from the latest Census of Agriculture reports for

Nelson, Spencer and Bullitt Counties are listed in Table 5.3. These data are based on countywide data with no assumptions made on a watershed level. The percentage of agricultural types of land cover is calculated for the entire watershed in Table 3.1 (Section 3.3) and for each sub-watershed in Section 8.

The Cox Creek watershed has a considerable agricultural resource with 55.65% of its land use devoted to agricultural operations, 46% of which is devoted to pasture land (Figure 3.3; MRLC NLCD 2001). The prevalent threat to streams from agriculture is bacteria loading from animal wastes. Livestock often lay in or near the streams in search of shade or drinking water. Livestock with access to streams can have a direct impact on water quality when feces are deposited on stream banks or directly in the stream. Animals grazing in pasture often deposit feces on the land - bacteria that do not decay will runoff into streams during wet weather events. Table 3.1 conveys that there are approximately 30,244 acres or 47 square miles of agricultural pastureland use within the 102 square miles of this watershed.

The Ohio State University Agricultural Extension Service released a guidance document for the management of livestock manure. The document contains manure characteristics, handling/storage and application procedures and also addresses some of the issues and considerations involved with manure management (James 2006). A similar (though as not detailed) document is available from the North Carolina State University College of Agriculture and Life Sciences (Shaffer 2005). These documents could be used to estimate pathogenic contributions from livestock if it could be determined how much manure actually made it to a stream since it is unrealistic that an animal would be directly contributing to a stream throughout the day. However if Standard Operating Procedures for wastewater collection systems and BMPs are utilized, pathogenic contributions to surface waters from livestock operations should not cause an exceedance of the WQC.

Crops may be a source of bacteria if manure is used as a fertilizer. However if BMPs are utilized (as discussed on the KAWQA webpage, <http://www.conservation.ky.gov/programs/kawqa/>) pathogenic contributions to surface waters should not cause an exceedance of the WQC.

Table 5.3 USDA Agricultural Statistics for Madison County (2007)

Statistic	Bullitt County	Nelson County	Spencer County
Farms (number/acres)	519/ 51,148	1,406/ 196,225	596/ 73,289
Cattle and Calves Inventory (farms/ total number)	241/ 6,124	817/ 46,329	303/ 13,097
Beef Cows (farms/total number)	218/ 3,693	684/ 18,185	282/ 6,985
Milk Cows (farms/total number)	5/ 237	40/ 2,820	7/ 401
Hogs and Pigs (farms/ total number)	13/ 445	38/ 27,869	14/ 248
Horses and Ponies (total number)	1,138	2,737	882
Layers 20 weeks old or older (farms/total number)	42/ 1,457	88/ 6,862	29/ 1,860
Broilers & other meat-type chickens sold (farm/total number)	-	3/ 2,400	2/ (D)*
Corn for grain (acres)	38/ 2,075	120/ 15,522	31/ 2,060
Tobacco (acres)	54	1,080	597
Wheat for grain (acres)	7/ 703	27/ 3,635	9/ 706
Soybeans for beans (acres)	3,578	15,088	2,264

* Withheld by USDA to avoid disclosing data for individual farms.

5.2.3 Wildlife

Wildlife undoubtedly contributes to bacteria loading. The Kentucky Department of Fish and Wildlife Resources estimate deer densities per square mile for all counties of Kentucky (Yancy, Personal Communication, 2008). There are approximately 21 deer per square mile in Bullitt County (4,191 total), 24 deer per square mile in Nelson County (8,385 total) and 51 deer per square mile in Spencer County (7,771 total).

Estimates of deer populations are shown for the watershed in Table 5.4. The assumption was made that deer remain constant throughout the year and are present (and evenly distributed) on all land classified as agricultural, forested, grasslands, and wetlands – because this is a rural watershed developed land was also included. Estimates of numbers of other types of wildlife are not available for Kentucky.

As stated above, although wildlife contributes bacteria to surface water, such contributions represent natural background conditions and receive no reductions within a TMDL. Wildlife such as opossums, raccoons, rats, and birds that may reside within subdivisions may be a larger contributor to bacteria runoff as these areas tend to have less permeable surfaces.

Table 5.4 Estimated Deer Populations within Cox Creek

County/ Stream	Watershed Area within County (sq mi)	Deer per Square Mile of Land	Estimated Deer Population in Watershed
Bullitt County/ Cox Creek	16.26	21	341.46
Nelson County/ Cox Creek	74.92	24	1,798.08
Spencer County/ Cox Creek	10.58	51	539.58

5.2.4 Human Waste

Human waste disposal is of particular concern in rural areas. Areas not served by sewers either employ an Onsite Sewage Treatment and Disposal System (OSTDS) or do not treat their sewage. There are few sewer lines located in the Cox Creek watershed (Figure 5.1). The rural area not serviced by sewer must either have an OSTDS or may not be treating their sewage. The U.S. Census of 2010 estimated that there was an average of 250.2 persons per square mile in Bullitt County, 104 persons per square mile in Nelson County and 91.4 persons per square mile in Spencer County. OSTDS including septic tank systems are commonly used in areas where providing a centralized sewage collection and treatment system is not cost effective or practical. When properly sited, designed, constructed, maintained, and operated, septic systems are an effective means of disposing and treating domestic waste. The effluent from a well-functioning OSTDS is comparable to secondarily treated wastewater from a sewage treatment plant. When not functioning properly, they can be a source of nutrients (nitrogen and phosphorus), bacteria and other pollutants to both groundwater and surface water.

The USDA Natural Resources Conservation Service (NRCS) National Geospatial Management Center archived and distributed the Soil Survey Geographic (SSURGO) Database which contains

the most recent soil survey information in a geographic area. The SSURGO rates the performance of septic tank absorption fields, defined as the area in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Soil ratings are based on soil properties, site features, and the observed performance of the soils - permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of septic tank effluents. Soils in the study area include the Beasley, Fairmount, Faywood and Lowell series. USDA rates these soil series as very limited for installation of septic tank absorption fields due to slope and severely eroded soils (i.e. shallow soil profiles). Based on the soil ratings and prevailing bedrock formations it is likely many of the septic systems in the watershed are not functioning properly.

A type of non KPDES-permitted source that may exist in the watershed is straight-pipes, which are discrete conveyances that discharge sewage, gray water (i.e., water from household sinks, laundry, etc.) and stormwater to the surface waters of the Commonwealth without treatment. Although straight-pipes meet the definition of a point source as defined in 401 KAR 10:002, EPA considers them to be part of the LA as they are a non KPDES-permitted source.

5.2.5 Household Pets

Although household pets undoubtedly exist in Cox Creek, their contribution to the LA is deemed to be minimal compared to other sources in the rural portions of the watershed. Pet waste may, however, be a larger contributor to bacteria runoff within subdivisions where there is a tendency to have a higher density of households and less permeable surfaces.

According to the American Veterinary Medical Association, by the end of 2011, 36.5% of all households (nationally) owned an average 1.6 dogs and 30.4% owned an average 2.1 cats.

5.3 Illegal Sources

Both KPDES-permitted and non KPDES-permitted sources can discharge bacteria to surface water illegally. This includes sources that are illegal simply by their existence, such as straight-pipes and SSOs, which receive no allocation. There may also be legal sources that are operating illegally (e.g., outside of regulations, permit limits or conditions, etc.), such as a WWTP bypass or a failing OSTDSs, which receive no allocation above that of a properly functioning system (see Section 7.0 for TMDL allocations).

Another potential illegal source is livestock on farms that have no BMPs (as required under the AWQA) as well as farms where BMPs are present but are insufficient or failing in a manner that causes or contributes to surface water impairment; such farms receive no allocation above that of a farm with properly installed and functioning BMPs. Also included are KNDOPs, AFOs and CAFOs not in compliance with the appropriate regulations that cause or contribute to a surface water impairment.

KDOW expects implementation of these TMDLs to begin with the elimination of illegal sources. This is intended to prevent legally operating sources from having to effect reductions in order to

accommodate the pollutant loading of illegal sources. Note this Section of the TMDL is not intended to summarize the universe of potential illegal sources that may discharge pollutants into surface waters, nor does it attempt to summarize the universe of legal sources that may be operating illegally. Instead, it gives examples of illegal sources known to be present or that could be present in the watersheds (e.g., straight-pipes).

6.0 Water Quality Criterion

Title 401 KAR 10:031 describe the standards used to “protect the surface waters of the Commonwealth, and thus protect water resources.” *Escherichia coli* (*E. coli*) bacteria are pathogen indicator organisms. *E. coli* data are used to indicate the degree of support for primary contact recreation (PCR) use. The stream is assessed as fully supporting the PCR use if the *E. coli* content does not exceed the criterion of 240 colonies per 100 ml in less than 20 percent of samples; it was assessed as partially supporting the PCR use if the criterion was not met in 25-33 percent of samples, and as not supporting the PCR use if the criterion was not met in greater than 33 percent of samples. Streams assessed as either nonsupport or partial support are considered impaired. Stream segments were sampled twice a month in addition to a geometric mean in the spring and fall during the PCR season of May 1 through October 31, 2011.

The WQC in 401 KAR 10:031 (Kentucky’s Surface Water Standards) for the PCR use are based on both fecal coliform and *E. coli*. Per 401 KAR 10:031:

“The following criteria shall apply to waters designated as primary contact recreation use during the primary contact recreation season of May 1 through October 31: Fecal coliform content or Escherichia coli content shall not exceed 200 colonies per 100 ml or 130 colonies per 100 ml respectively as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 400 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for fecal coliform or 240 colonies per 100 ml for Escherichia coli.”

Both the geomean and instantaneous criteria of 130 and 240 *E. coli* colonies/100 ml, respectively, were applied to calculate allowable loadings to bring the watershed into compliance with the PCR designated use. The loading requiring the greatest percent reduction was used to set the TMDL for a segment. See Section 7.0 for TMDL loading calculations.

Because Kentucky has a dual standard for the PCR designated use, development of TMDLs using the *E. Coli* criterion are sufficient to provide TMDLs for fecal coliform-listed segments and vice versa (i.e., development of *E. Coli* TMDLs will protect the PCR use regardless of whether a segment is impaired for *E. Coli*, fecal coliform, or both). Additionally, because the instantaneous limit is lower for PCR than for SCR (400 colonies/100 ml versus 2000 colonies/100 ml), development of TMDLs for the PCR season also protects segments impaired for the SCR use due to fecal coliform.

7.0 Total Maximum Daily Load

The USEPA defines a TMDL as “a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant’s sources. Water quality standards are set by States, Territories, and Tribes. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs (USEPA 2008c).”

7.1 TMDL Equation and Definitions

A TMDL calculation is performed as follows:

$$\text{TMDL} = \text{MOS} + \text{WLA} + \text{LA}$$

Where:

TMDL: the WQC or the maximum load the waterbody can naturally assimilate while still meeting the WQC of 240 colonies per 100 ml at a given flow, in units of colonies per day.

MOS: the Margin of Safety, which can be an implicit or explicit additional reduction applied to the WLA, LA or both types of sources that accounts for uncertainties in the data or TMDL calculations. The MOS for these TMDLs was set at 10% to generate an explicit MOS.

TMDL Target: the TMDL minus the MOS.

WLA: the Waste Load Allocation (allowable loadings from KPDES-permitted sources such as SWSs and MS4s).

SWS-WLA: the WLA for KPDES-permitted sources, which have discharge limits for bacteria (including wastewater treatment plants, package plants and home units).

Remainder: the TMDL Target minus the WLA

Future Growth-WLA: the allowable loading for future KPDES-permitted sources, including new SWSs, expansion of existing SWSs, new storm water sources, and growth of existing storm water sources (such as MS4s).

MS4-WLA: the WLA for KPDES-permitted municipal separate storm water sewer systems (including, but not limited to cities, counties, KYTC, universities and military bases).

LA: the Load Allocation, including natural background and non-KPDES permitted sources.

Seasonality: Yearly factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses.

Critical Condition: When the pollutant conditions are expected to be at their worst.

MAF: the Mean Annual Flow as defined by USGS.

Adjusted MAF: the MAF plus SWS-WLA design flows (where applicable).

Critical Flow: the flow used to calculate the TMDL as a load (equivalent to the Adjusted MAF)

Existing Conditions: the load that exists in the watershed at the time of TMDL development (i.e., sampling) and is causing the impairment, see Section 7.6.

Percent Reduction: the reduction needed to bring the existing conditions (i.e., the existing non-SWS sources) in line with the Remainder, see Section 7.7.

Load: Concentration * Flow * Conversion Factor in colonies per day

Concentration: colonies per 100 milliliters (col/100ml)

Flow (i.e. stream discharge): cubic feet per second (cfs)

Conversion Factor: the value which converts the product of Concentration and Flow to Load (in units of colonies per day); it is derived from the calculation of the following components: (28.31685L/cf * 86400sec/day * 1000ml/L)/ (100ml) and is equal to 24465758.4.

The TMDL calculation must take into account seasonality and other factors that affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses. Once a critical flow is obtained (see Sections 7.5 and 7.8), it is then multiplied by the WQC minus the MOS (10%) times the appropriate conversion factors to obtain the TMDL Target load. Allowable loadings from KPDES-permitted sources are then subtracted from the Target load to produce the Remainder. Future growth calculations are then performed and subtracted from the Remainder, leaving the LA.

However, regardless of the procedure used to calculate the TMDL, reductions from existing conditions ultimately must be effected within the watershed only until all stream segments meet the PCR use, or until all sources (except wildlife) are discharging in compliance with the WQC. Once the WQC is met, all sources (apart from wildlife) must continue to discharge at a load that meets the WQC.

7.2 Margin of Safety

The MOS can be an implicit (using conservative assumptions) or explicit (a reserved portion) additional reduction applied to the WLA, LA or to both types of sources that accounts for uncertainties in the data or TMDL calculations. For these TMDLs, a 10% explicit MOS (i.e., 10% of the WQC or 24 colonies/100ml) was reserved to address uncertainties involving loading from non-SWS sources. SWS sources have an implicit MOS based on the fact that they seldom operate at their design flow. The explicit MOS load was calculated using the following equation:

$$\text{MOS (colonies/day)} = \frac{\text{Critical Flow}}{(\text{cfs})} \times \frac{24}{(\text{colonies/100ml})} \times \text{Conversion Factor } 24465758.4$$

7.3 Waste Load Allocation

The WLA is the portion of the TMDL allocated to KPDES-permitted sources within the watershed. There is currently one KPDES-permitted source within Cox Creek.

7.3.1 SWS-WLA

The WLA for KPDES-permitted sources discharging to an impaired segment were calculated using their permitted effluent limits for *E. coli* (i.e. the WQC of 240 col/100 ml) and facility

design flow (or average daily flow for facilities with comingled waste streams) by means of the following equation:

$$\text{WLA (colonies/day)} = \frac{\text{Design Flow or Average Daily Flow (cfs)}}{240 \text{ (colonies/100ml)}} \times \text{Conversion Factor } 24465758.4$$

The individual SWS-WLAs for each facility that discharges to an impaired segment are summed to create a final SWS-WLA for that segment. There are a total of twelve SWS-WLAs in Cox Creek.

7.3.2 Remainder

The Remainder is not part of the TMDL however; it is used in the TMDL calculations. It is defined as the TMDL Target load minus the sum of all SWS-WLAs.

7.3.3 Future Growth WLA

A TMDL document will often account for future growth of current or new KPDES-permitted sources in order to avoid having to re-open the TMDL when new sources come online or current ones expand. Future growth is represented by a portion of the Remainder which is set aside (i.e. it is not part of the LA nor is it part of the WLA for current/known sources). It can also include existing storm water sources which are later discovered to discharge the pollutant of concern, even though this fact may not be known at the time the TMDL was written. The loading amount reserved for future growth is determined by using Table 7.1 which assumes that growth occurs more rapidly in a developed area (which is determined by the sum of developed open space, developed low intensity, developed medium intensity and developed high intensity areas as defined by the 2001 USGS NLCD) than in rural areas. The Future Growth WLA for each impaired segment is shown in Table 7.2 and calculated using the following formula:

$$\text{Future Growth-WLA} = \text{Remainder} \times \text{Future Growth-WLA percentage}$$

Table 7.1 Future Growth Matrix

Percent Developed Area in the Subwatershed	Future Growth WLA Percentage
≥25%	5%
≥20% – <25%	4%
≥15% – <20%	3%
≥10% – <15%	2%
≥5% – <10%	1%
<5%	0.5%

Table 7.2 Future Growth Percentage by Impaired Segment

Waterbody Segment and RMs	Percent Developed Area	Percent of Remainder Set Aside for Future Growth
Cox Creek 0.0 to 4.7	3.73%	0.5%
Cox Creek 4.7 to 11.4	4.22%	0.5%
Cox Creek 11.4 to 18.6	4.56%	0.5%
Cox Creek 18.6 to 23.9	3.98%	0.5%
Caney Fork 0.0 to 4.0	5.1%	1%
Froman Creek 0.0 to 1.25	4.3%	0.5%
East Fork Cox Creek 0.0 to 4.3	3.75%	0.5%
West Fork Cox Creek 0.0 to 6.9	2.68%	0.5%
Rocky Run 0.0 to 2.3	1.84%	0.5%

7.3.4 MS4-WLA

If there is a MS4 within the upstream area of the impaired segment, a MS4-WLA must be calculated. A larger MS4 will not be responsible for other MS4s present within its boundaries (e.g. a City-MS4 is not responsible for a University or KYTC-MS4 within its permitted boundary). The MS4-WLA is calculated using the following equation:

$$\text{Remainder} \times \frac{\% \text{ of (developed acres in MS4 boundary) / (total acres in subwatershed)}}{100} = \text{MS4-WLA}$$

7.4 Load Allocation

The LA is the portion of the TMDL where non KPDES-permitted sources (e.g., nonpoint sources, or those not permitted by KPDES) receive their allocation within the TMDL. Within Cox Creek, these sources can include properly functioning OSTDS (i.e. septic systems), wildlife, household pets and facilities with properly functioning BMPs (e.g. agricultural farms or landfarms for municipal SWS sludge). LAs were calculated using the following equation:

$$\text{LA} = \text{Remainder} - \frac{\text{Future Growth}}{\text{WLA}} - \text{MS4-WLA}$$

The available sampling data were insufficient to apportion the existing loading among the various LA sources; therefore, it is attributed to all LA sources. LAs for each impaired segment are presented and discussed in Section 8. As discussed in Section 5.3, implementation of these bacteria TMDLs is expected to begin with the elimination of illegal sources such as failing OSTDS and straight-pipes if present in the watershed. In addition, facilities not in compliance with KNDOP regulations or BMP requirements under the AWQA are also illegal and are expected to come into compliance.

7.5 Seasonality

Seasonality is defined as yearly factors such as temporal variations on source behavior and stream loading than can affect the relationship between pollutant inputs and the ability of the stream to meet its designated uses. This TMDL addresses seasonality by only using samples collected within the PCR season (May - October).

7.6 Critical Condition

The critical condition for nonpoint source bacteria loading typically occurs after a runoff event, preceded by an extended dry period - bacteria accumulate on the land surface (during the dry period) and are subsequently washed off by the rainfall. The critical condition for point source loading typically occurs during periods of low streamflow when dilution (of effluent) is minimized. The Cox Creek watershed contains both types of sources; therefore the critical condition for each bacteria-impaired segment is defined by the sample showing the highest exceedance.

7.7 TMDLs Calculated as a Daily Load

Federal guidelines of the Clean Water Act require a TMDL to be expressed in terms of a daily load. Due to the limited amount of data available, particularly the absence of stream gages or in-stream flow data, a method was developed utilizing the WQC and Mean Annual Streamflow (MAF). The USGS has generated a MAF value for streams across Kentucky. The MAF values were calculated using the equation found in the USGS Water-Resources Investigations Report 02-4206 "Estimating Mean Annual Streamflow of Rural Streams in Kentucky" (http://ky.water.usgs.gov/pubs/wrir_2002_4206.pdf). The MAF values can be found on the Kentucky Watershed Viewer webpage (<http://gis.gapsky.org/watershed/>) or downloaded from the Kentucky Geography Network (<http://kygeonet.ky.gov/>). Once obtained, major inputs (i.e., WWTP design capacity) were added to the MAF to generate a critical flow. The critical flow is then multiplied by the WQC minus the MOS (10%) times the appropriate conversion factors to obtain the TMDL Target (i.e., the allowable daily load).

8.0 TMDL Calculations

Bacteria TMDLs have been developed using a range of techniques from sophisticated watershed-based computer modeling to qualitative assumptions and simple mass balance. An approach focusing on the WQC and MAF was utilized for development of these bacteria TMDLs. The best available data from various sources was analyzed and spatial analysis was performed within a GIS framework to obtain MAF values, assess KPDES-permitted and non KPDES-permitted sources, and appropriately assign TMDL loads. Development of these TMDLs follows the procedures outlined in Kentucky's *Quality Assurance Project Plan (QAPP) for Data Analysis for TMDL Development* and maintains the guidelines set in the *Pathogen TMDL Standard Operating Procedures* for evaluating the TMDL approach (KDOW 2011).

8.1 Data Validation

Data validation was performed as follows:

- Only samples collected from a flowing stream were considered in analysis.
- Quality Analysis/Quality Control Samples (e.g. duplicates and blanks) were excluded from the dataset.
- The data tables show both *E. coli* concentrations and flows; in some cases the flows were measured in-stream at the time the sample was collected. On other occasions no flow data were collected; this may have been due to a high water event that precluded samplers from entering the stream due to safety reasons, or other considerations.
- Some samples were reported using either the *less than* (denoted using the "<") symbol or the *greater than* (denoted using the ">") symbol, indicating the true concentration was unknown but it was either below or above the reported value, respectively. For samples *less than* the reported value, the reported value was used verbatim. For *greater than* values, the values were used verbatim because all showed exceedances of the WQC. While in such cases the exact value of the exceedance is unknown and likely higher than the number reported, the sample still gave insight into the status of the waterbody at the time the sample was taken.

8.2 Individual Stream Segment Analysis

Data collection and analysis from various sources (including Federal, State and local government, and public entities) was carried out for each individually listed stream segment and its associated drainage area. Spatial analysis was also performed within a GIS framework. Most of the data collected for the development of this document can be accessed and downloaded from the Kentucky Geography Network (<http://kygeonet.ky.gov>).

Results from the watershed sampling event in 2009 indicated new impaired segments in several tributaries of the watershed. An overview of the watershed is followed by a brief discussion of each segment and along Cox Creek and then tributaries, beginning in the headwaters.

8.2.1 Cox Creek of the Salt River

Cox Creek of the Salt River is a fourth order stream that is mostly contained within Nelson County with northern areas extending into Bullitt and Spencer Counties. Cox Creek originates in northeastern Bardstown and flows in a northwesterly direction for 23.9 miles. The stream drains an area of 101.95 square miles before entering the Salt River near the community of Solitude, KY. Cox Creek drops about 400 feet in elevation from its origin to the mouth.

Land cover in Cox Creek is largely agricultural pastureland (46.44%) followed by forest (37.17%; Table 8.1). In 2001, only 3.73% of the total land area was developed and mostly located along rural roads and small towns (including Bardstown, Cox's Creek, Lotus and High Grove; Figure 8.1). Approximately 2/3 of the watershed is sensitive or prone to karst features with several mapped springs and sinkholes dotting the watershed (see Figure 3.2). The soil and bedrock properties of the watershed can provide a challenge for septic system and basement installation and maintenance but can also provide good farmland in many areas.

Table 8.1 Land Cover in the Cox Creek Watershed (NLCD 2001)

Land Use	% of Total Area	Acres	Square Miles
Forest	37.17%	24,206.90	37.82
Agriculture (total)	55.65%	36,241.46	56.63
Pasture	46.44%	30,244.06	47.26
Row Crop	9.21%	5,997.40	9.37
Developed	3.73%	2,431.47	3.80
Natural Grassland	2.35%	1,528.87	2.39
Wetland	0.48%	312.60	0.49
Barren	0.10%	65.42	0.10

As of the last Census (2010), there were an estimated 250.2, 91.4 and 104 persons per square mile in Bullitt, Spencer and Nelson Counties, respectively. Estimates of the population in the Cox Creek watershed are provided in Table 8.2. Sewer lines cover a very small portion of the watershed but there are planned upgrades and expansions extending service to some individuals and Cox's Creek Elementary in the south central area of the watershed (Figure 8.1 and Section 5.1.1.2). All other areas of the watershed rely on OSTDS or do not treat their sewage.

Table 8.2 Estimated Populations in the Cox Creek Watershed According to the 2010 US Census

County/ Stream	Watershed Area within County (sq mi)	Persons per Square Mile	Estimated Population in Watershed
Bullitt County/ Cox Creek	16.26	250.2	4,068.25
Nelson County/ Cox Creek	74.92	104	7,791.68
Spencer County/ Cox Creek	10.58	91.4	967.01
Cox Creek Watershed Total	101.76		12,826.94

According to the latest KDOW watershed study the sampling site with the highest percent exceedance of the WQC (90.9%) was the site on Cox Creek near RM 8.3 (DOW12005005). Two other sites on Rocky Run (DOW12005003) and Caney Fork (DOW12005009) were close behind with 90% exceedance of the WQC; none of the sites had a percent exceedance lower than 70%. The Cox Creek watershed to RM 4.7 and Caney Fork are dominated by agricultural pasture land, have very few sewers, fair to poor dissolved oxygen (DO) levels and a lack of habitat, riparian zone and available cover around the waterbody. Rocky Run is dominated by forest land though it is completely contained within the Bullitt County MS4 community and also has no sewers.

Conductivity levels across the watershed were fairly good indicating reasonably low dissolved solids. DO levels were suitable at most sites, the few sites that had poor levels likely resulted from lack of shade around the waterbody, coupled with nutrient runoff. The site on Cox Creek near RM 16.5 (DOW12005008) had the best overall water quality though biology and habitat data were not collected. The site on East Fork Cox Creek (CFD12005501) had one of the best overall scores, tying with Rocky Run (DOW12005003) despite the fact that both had bacteria exceedances of the WQC higher than 80%. Though East Fork is dominated by pasture land in the headwaters and has a poor riparian zone, much of the subwatershed toward the mouth is forested; Rocky Run is also mostly forested though its riparian zone is lacking toward the mouth.

More information from the watershed study can be found in Section 4 or Appendix B. More information on what you can do to improve the health of Cox Creek can be found in Section 9.

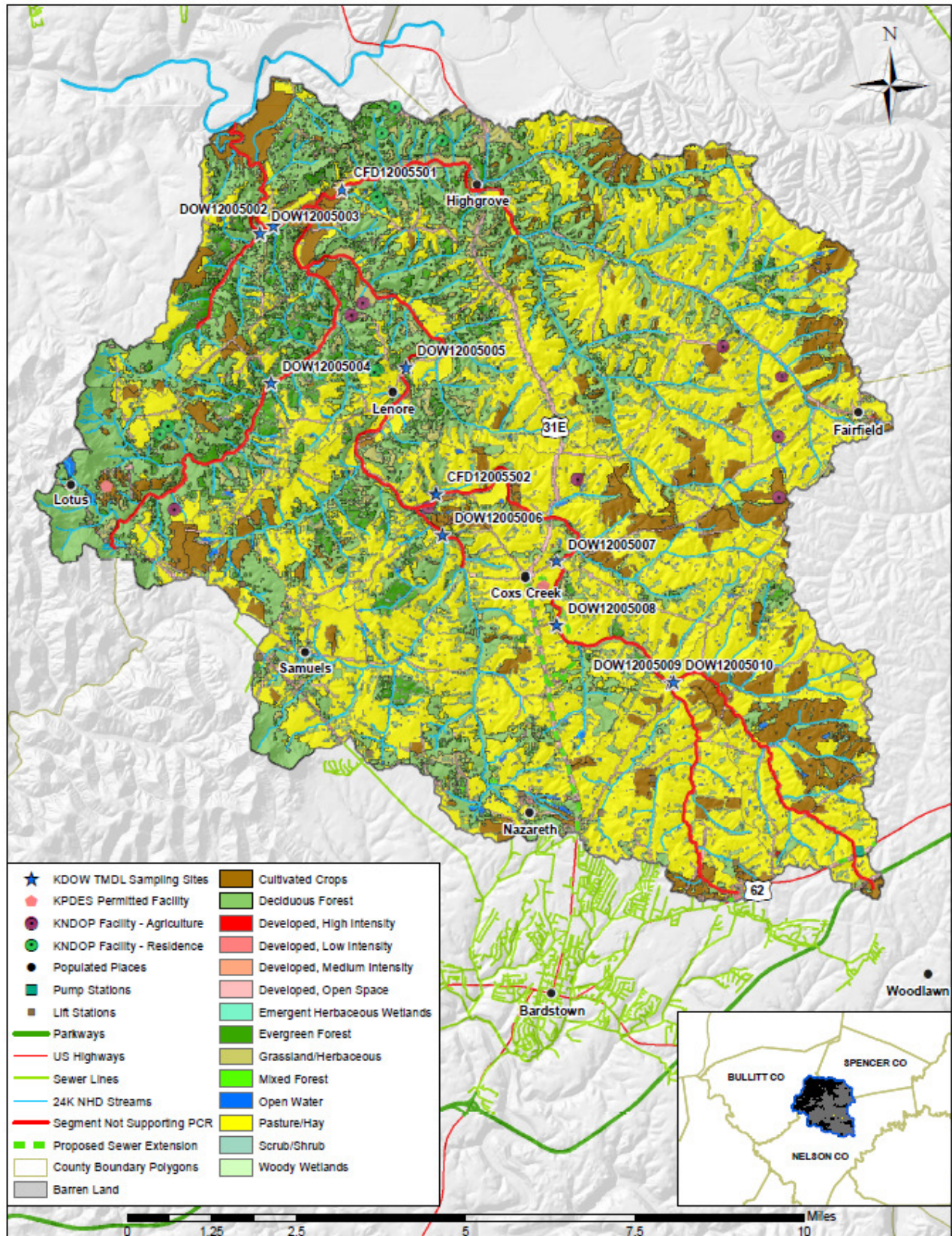


Figure 8.1 Land Cover, KPDES-Permitted Sources and Wastewater Infrastructure within the Cox Creek Watershed

8.2.1.1 Cox Creek 18.6 to 23.9 into Salt River

Cox Creek quickly becomes a third order stream in the middle of this segment. Exceedance of the WQC (240 col/100ml) was observed in 100% of the samples collected – the highest concentration of all samples was greater than 24,190 colonies per 100 ml (Table 8.3). *E. coli* concentrations appear to increase with increased or little precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed. There is one pump station and one proposed sewer extension but no other KPDES-permitted sources upstream of RM 18.6. Therefore this loading suggests nonpoint sources in the watershed such as straight-pipes, animals in streams or failing OSTDS. There are no sewer lines so residents to this point must rely on OSTDS or do not treat their sewage.

Table 8.3 *E. coli* Data Collected for Cox Creek above Murray Run Road bridge (RM 18.75) - DOW12005010

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	6.880	>2420	heavy and steady rain through the last 48 hours, ~1"
05/13/09	6.880	1553	About 3 days since last rainfall of 0.1"
06/02/09	0.254	2419	About 4 days since last rainfall of 0.1"
06/09/09	0.081	1203	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	>24190	Showers through the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	0.654	285	Showers in the last 24 hours, ~0.1"
08/11/09	0.366	345	Showers in the last 24 hours, ~0.3"
09/22/09	0.623	14140	Showers and rain through the last 48 hours, ~2.5"
10/13/09	5.972	1270	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	22.009	1203	Showers through the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

The predominant land cover in the watershed to the bottom of this impaired segment is agricultural pastureland (59.19%) followed by row crops (22.19%; Figure 8.2). Based on the WQC and the MAF, the *E. coli* TMDL for the 5.3 mile impaired segment of Cox Creek is 5.99×10^{10} colonies per day (Table 8.4). In addition, any future KPDES-permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

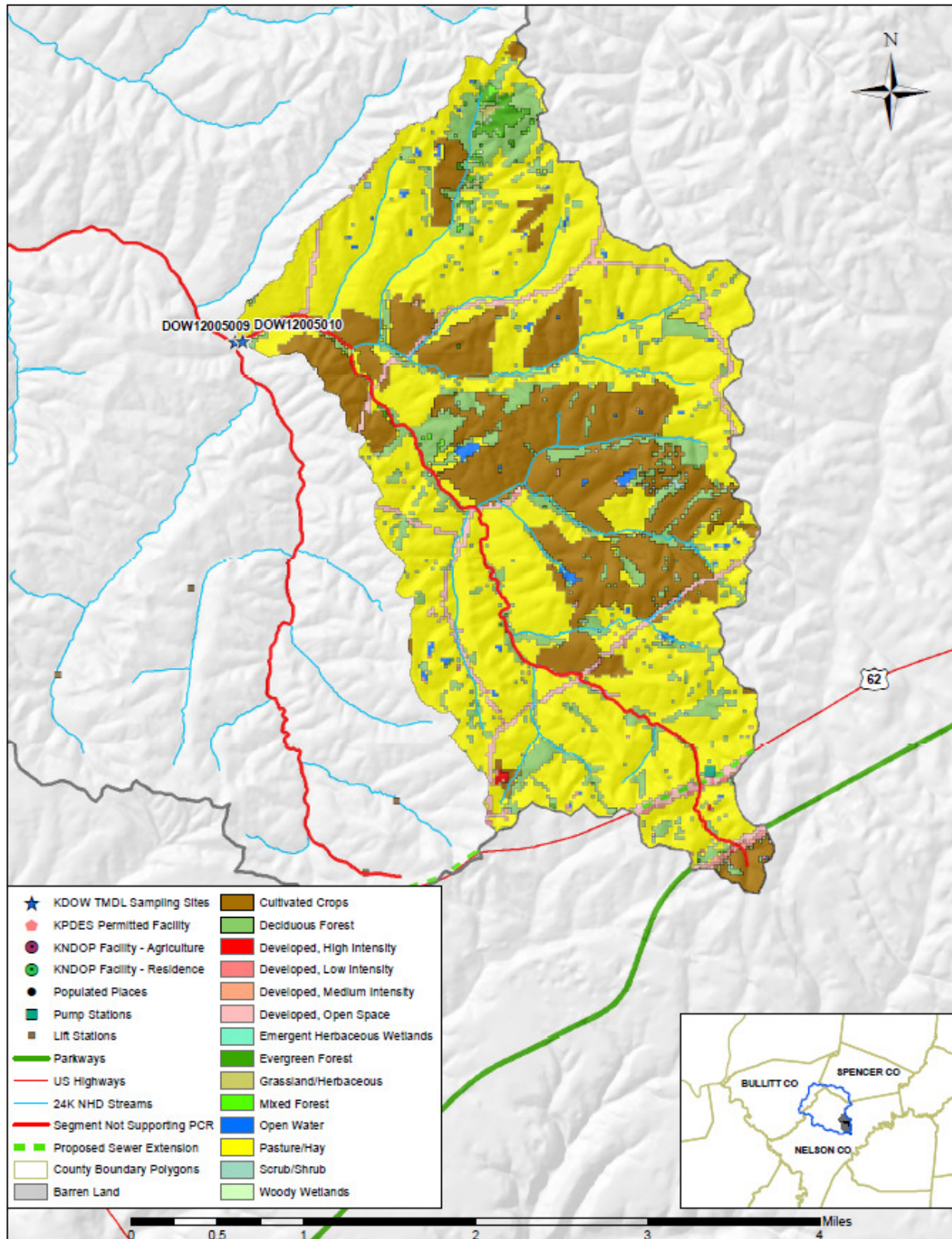


Figure 8.2 Land Cover for Cox Creek 18.6 to 23.9

Table 8.4 Summary of TMDL Components for Cox Creek 18.6 to 23.9

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
5.99×10 ¹⁰ col/day	5.99×10 ⁹ col/day	n/a	n/a	2.70×10 ⁸ col/day	5.36×10 ¹⁰ col/day	10.2

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

8.2.1.2 Cox Creek 11.4 to 18.6 into Salt River

Cox Creek becomes a fourth order stream near the top of this segment after collecting flow from Caney Fork. KDOW monitored three sites within the segment – site DOW12005008 near RM 16.5 showed the highest exceedance from the WQC and therefore was used to set the TMDL for the segment. Exceedance of the WQC (240 col/100ml) was observed in 77.8% of the samples collected – the highest concentration of all samples was greater than 2,420 colonies per 100 ml (Table 8.5). *E. coli* concentrations appear to increase with increased or little precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed. There are two KPDES-permitted sources (Coxs Creek Elementary and the city of Bardstown MS4 community), one CAFO (IPKY Hog Farm), one KNDOP (Wright Hog Farm) and some wastewater infrastructure upstream of RM 11.4. See Table 5.1 for individual WLAs. There are few sewer lines (in the headwaters of Caney Fork) so residents to this point mostly rely on OSTDS or do not treat their sewage.

Table 8.5 *E. coli* Data Collected for Cox Creek off Wheeler-Wright Lane; above Cox Creek Elementary (RM 16.55) - DOW12005008

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	18.947	>2420	heavy and steady rain in the last 48 hours, ~1"
05/13/09	15.656	2419	About 3 days since last rainfall of 0.1"
06/02/09	0.141	147	About 4 days since last rainfall of 0.1"
06/09/09	0.409	192	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	770	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	1.393	n/a	Showers in the last 24 hours, ~0.1"
08/11/09	0.756	387	Showers in the last 24 hours, ~0.3"
09/22/09	1.612	9210	Showers and rain in the last 48 hours, ~2.5"
10/13/09	11.364	1414	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	42.103	1553	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

Table 8.6 *E. coli* Data Collected for Cox Creek above Fairfield Road bridge (KY509; RM 15.4) - DOW12005007

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	21.509	>2420	heavy and steady rain in the last 48 hours, ~1"
05/13/09	16.903	2419	About 3 days since last rainfall of 0.1"
06/02/09	0.659	228	About 4 days since last rainfall of 0.1"
06/09/09	0.394	117	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	1733	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	1.425	>2419	Showers in the last 24 hours, ~0.1"
08/11/09	0.670	517	Showers in the last 24 hours, ~0.3"
09/22/09	1.827	1400	Showers and rain in the last 48 hours, ~2.5"
10/13/09	12.190	1046	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	37.922	2419	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

Table 8.7 *E. coli* Data Collected for Cox Creek below Cox Creek Road bridge (RM 11.8) - CFD12005502

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	29.950	>2420	heavy and steady rain in the last 48 hours, ~1"
05/13/09	17.982	770	About 3 days since last rainfall of 0.1"
06/02/09	1.035	12	About 4 days since last rainfall of 0.1"
06/09/09	0.638	31	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	1986	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	3.217	816	Showers in the last 24 hours, ~0.1"
08/11/09	1.079	120	Showers in the last 24 hours, ~0.3"
09/22/09	3.079	800	Showers and rain in the last 48 hours, ~2.5"
10/13/09	16.545	>2419	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	56.857	>2419	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

The predominant land cover in the watershed to the bottom of this impaired segment is agricultural pastureland (64.17%) followed by forest (16.76%; Figure 8.3). Based on the WQC and the MAF, the *E. coli* TMDL for the 7.2 mile impaired segment of Cox Creek is 1.33×10^{11} colonies per day (Table 8.8). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

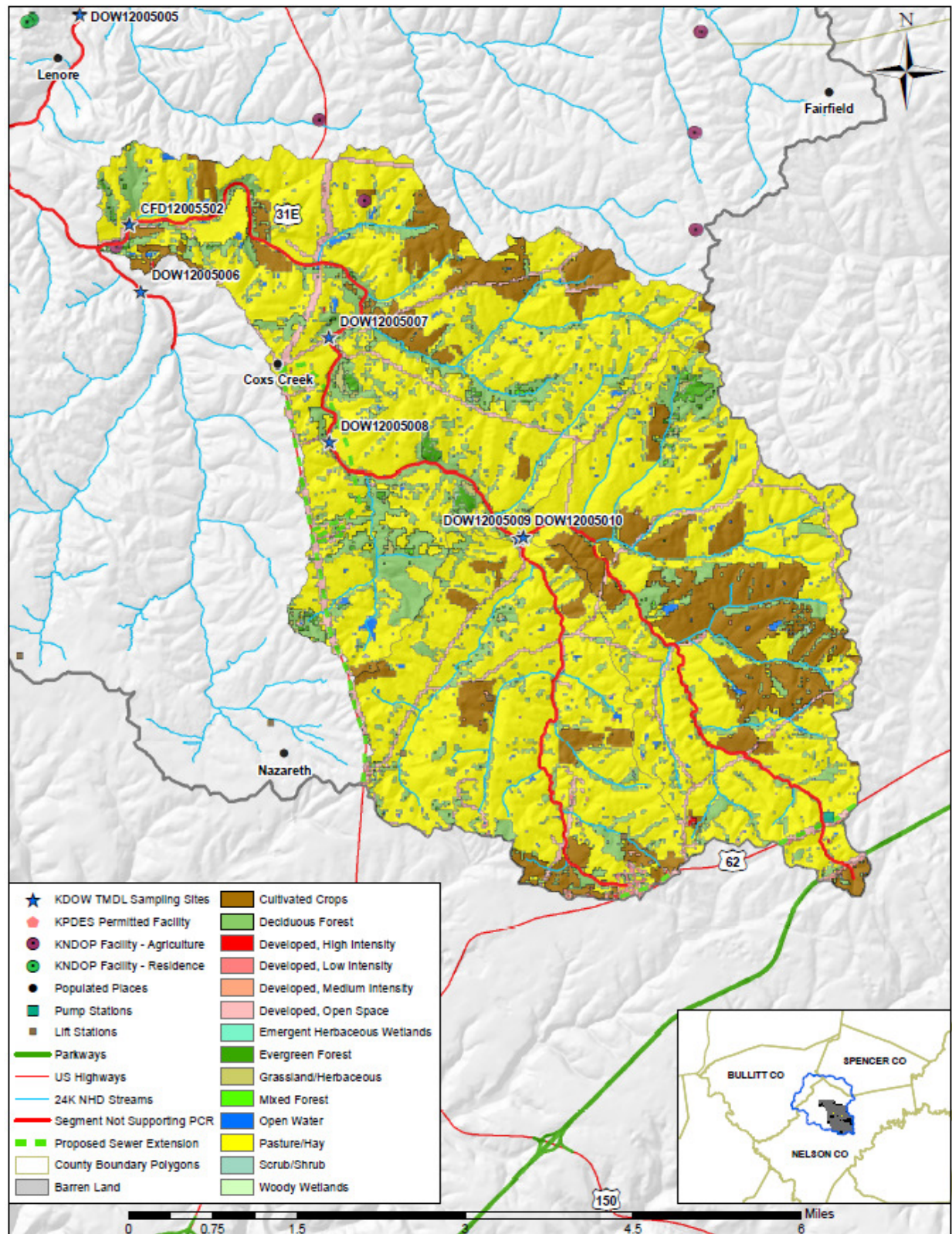


Figure 8.3 Land Cover for Cox Creek 11.4 to 18.6

Table 8.8 Summary of TMDL Components for Cox Creek 11.4 to 18.6

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA ⁽³⁾	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
1.33×10 ¹¹ col/day	1.33×10 ¹⁰ col/day	9.08×10 ⁷ col/day	5.77×10 ⁷ col/day	6.00×10 ⁸ col/day	1.19×10 ¹¹ col/day	22.7

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment.

8.2.1.3 Cox Creek 4.7 to 11.4 into Salt River

Cox Creek becomes a fifth order stream after collecting flow from Froman Creek at the top of the segment. In addition to the KPDES-permitted sources listed for the upstream segment, there are two home units (permits 12005031 and 120012005028) and two additional KNDOPs (Chris Hurst and Bob Robinson Hog Farms). There is additional wastewater infrastructure in the headwaters of Froman Creek and another tributary to its west. There are few sewer lines so residents must rely on OSTDS or do not treat their sewage. Exceedance of the WQC (240 col/100ml) was observed in 90.9% of the samples collected – the highest concentration of all samples was greater than 2,420 colonies per 100 ml (Table 8.9). *E. coli* concentrations appear to increase with little or no precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed such as aging/ inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.9 *E. coli* Data Collected for Cox Creek at Deatsville Rd. bridge (KY523; RM 8.3) - DOW12005005

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	68.221	>2420	heavy and steady rain in the last 48 hours, ~1"
05/13/09	31.659	248	About 3 days since last rainfall of 0.1"
06/02/09	3.235	25	About 4 days since last rainfall of 0.1"
06/09/09	2.263	365	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	435	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	7.104	770	Showers in the last 24 hours, ~0.1"
08/11/09	3.461	299	Showers in the last 24 hours, ~0.3"
08/26/09	0.107	548	5 days since last rainfall of more than 0.1"
09/22/09	6.611	980	Showers and rain in the last 48 hours, ~2.5"
10/13/09	29.209	1733	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	98.149	>2419	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

The predominant land cover in the watershed to the bottom of this impaired segment is agricultural pastureland (55.29%) followed by forest (29.47%; Figure 8.4). Based on the WQC and the MAF, the *E. coli* TMDL for the 6.7 mile impaired segment of Cox Creek is 3.38×10^{11} colonies per day (Table 8.10). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

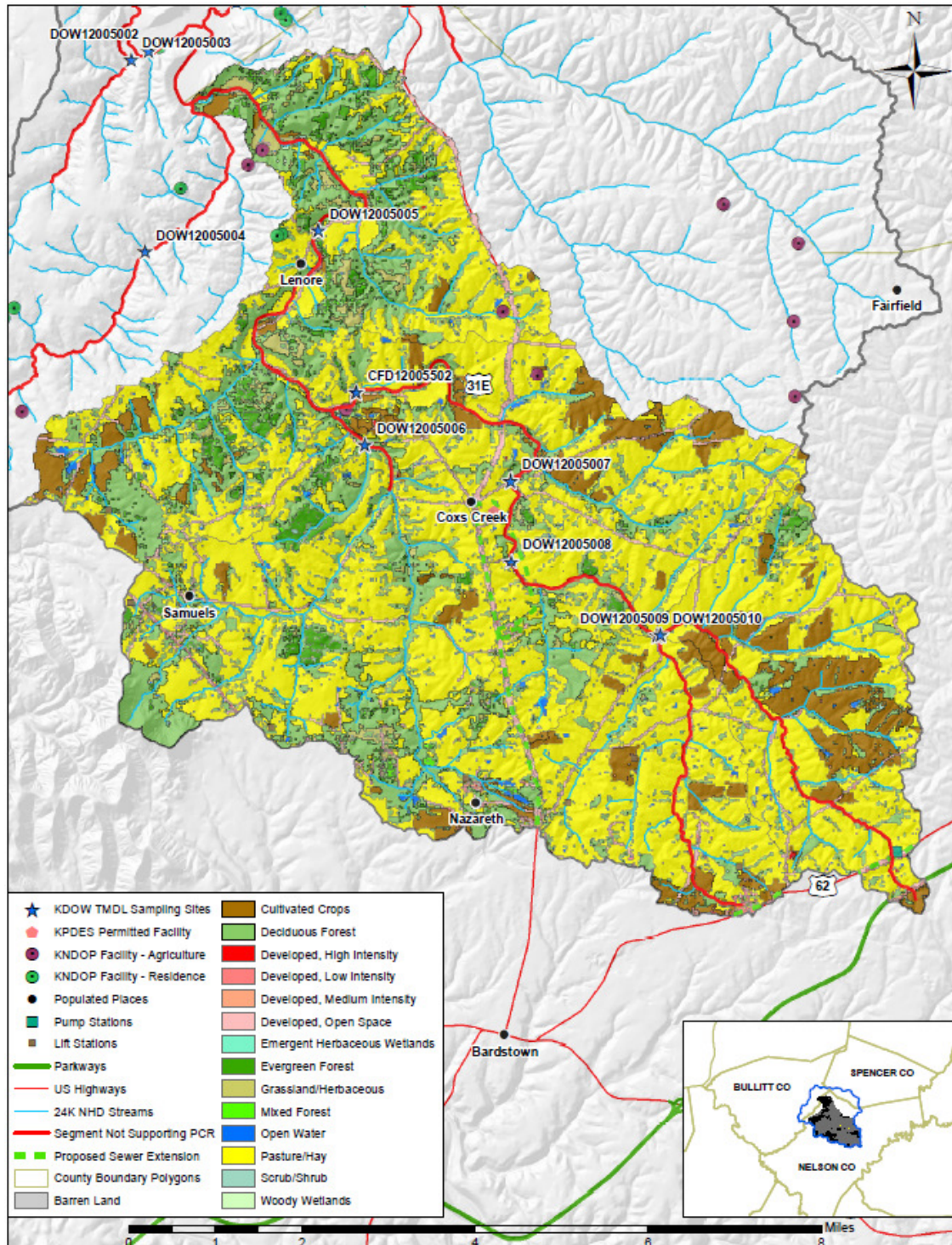


Figure 8.4 Land Cover for Cox Creek 4.7 to 11.4

Table 8.10 Summary of TMDL Components for Cox Creek 4.7 to 11.4

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
3.38×10 ¹¹ col/day	3.38×10 ¹⁰ col/day	9.08×10 ⁷ col/day	1.82×10 ⁸ col/day	1.52×10 ⁹ col/day	3.02×10 ¹¹ col/day	57.5

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment.

8.2.1.4 Cox Creek 0.0 to 4.7 into Salt River

Cox Creek remains a fifth order stream before discharging to the Salt River at the bottom of this segment. In addition to the KPDES-permitted sources listed in the upstream segments there are nine additional home units (permits 1206033, 12005032, 12005022, 12005018, 12004019, 12005027, 12005029, 12005026 and 12005035) and six additional KNDOPs (Lutz, Oliver Rogers, Robert Lutz, John McClaskey and Ulrich Dairy farms and Robinson Hog Farm). There are no sewer lines (other than those located in the headwaters of Caney Fork and Froman Creek) so residents must rely on OSTDS or do not treat their sewage. Exceedance of the WQC (240 col/100ml) was observed in 81.8% of the samples collected – the highest concentration of all samples was greater than 24,190 colonies per 100 ml (Table 8.11). *E. coli* concentrations appear to increase with little or no precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed such as aging/inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.11 *E. coli* Data Collected for Cox Creek off Cedar Grove Rd (RM 2.6) - DOW12005002

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	59.000	>2420	heavy and steady rain in the last 48 hours, ~1"
05/13/09	n/a	326	About 3 days since last rainfall of 0.1"
06/02/09	7.665	147	About 4 days since last rainfall of 0.1"
06/09/09	5.138	157	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	2419	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	19.786	2419	Showers in the last 24 hours, ~0.1"
08/11/09	6.164	249	Showers in the last 24 hours, ~0.3"
08/26/09	2.759	488	5 days since last rainfall of more than 0.1"
09/22/09	20.330	24190	Showers and rain in the last 48 hours, ~2.5"
10/13/09	68.809	1733	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	141.000	>2419	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

The watershed is dominated by agricultural land (55.65%) in the headwaters and central areas while forested land (37.17%) dominates the northern areas toward the mouth (Figure 8.5). Based on the WQC and the MAF, the *E. coli* TMDL for the 4.7 mile impaired segment of Cox Creek is 6.68×10^{11} colonies per day (Table 8.12). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

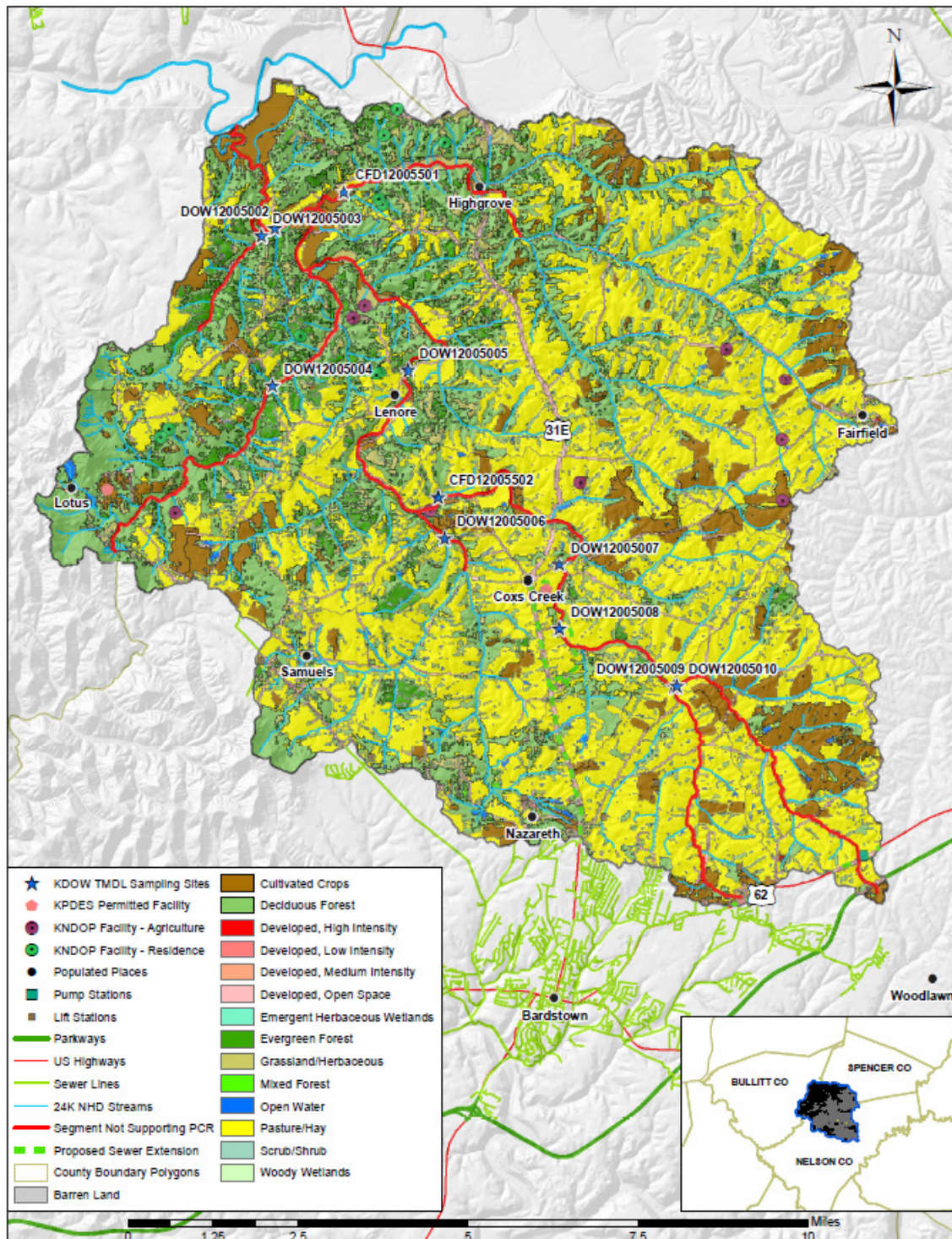


Figure 8.5 Land Cover for Cox Creek 0.0 to 4.7

Table 8.12 Summary of TMDL Components for Cox Creek 0.0 to 4.7

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA ⁽³⁾	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
6.68×10 ¹¹ col/day	6.68×10 ¹⁰ col/day	9.08×10 ⁷ col/day	1.94×10 ⁸ col/day	3.00×10 ⁹ col/day	5.98×10 ¹¹ col/day	113.7

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment.

8.2.1.5 Caney Fork 0.0 to 4.0 into Cox Creek

Caney Fork is a third order stream that discharges to Cox Creek near RM 18.6. There is one KPDES-permitted source (city of Bardstown MS4 community) and wastewater infrastructure including sewer lines and lift stations in the headwaters. There are no sewer lines in the bottom portion of the subwatershed so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by nearly 72% agricultural pastureland followed by forest (12.16%; Figure 8.6). Exceedance of the WQC (240 col/100ml) was observed in 90% of the samples collected – the highest concentration of all samples was greater than 24,190 colonies per 100 ml (Table 8.13). *E. coli* concentrations appear to increase with little or no precipitation suggesting the loading may be caused by both KPDES-permitted and non KPDES-permitted sources in the watershed such as aging/inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.13 *E. coli* Data Collected for Caney Fork above Murray Run Road bridge (RM 0.05) - DOW12005009

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	7.733	1986	heavy and steady rain in the last 48 hours, ~1"
05/13/09	7.110	>2419	About 3 days since last rainfall of 0.1"
06/02/09	0.176	>2419	About 4 days since last rainfall of 0.1"
06/09/09	0.061	1986	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	>24190	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	0.582	236	Showers in the last 24 hours, ~0.1"
08/11/09	0.130	308	Showers in the last 24 hours, ~0.3"
09/22/09	0.498	290	Showers and rain in the last 48 hours, ~2.5"
10/13/09	3.439	850	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	10.601	980	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

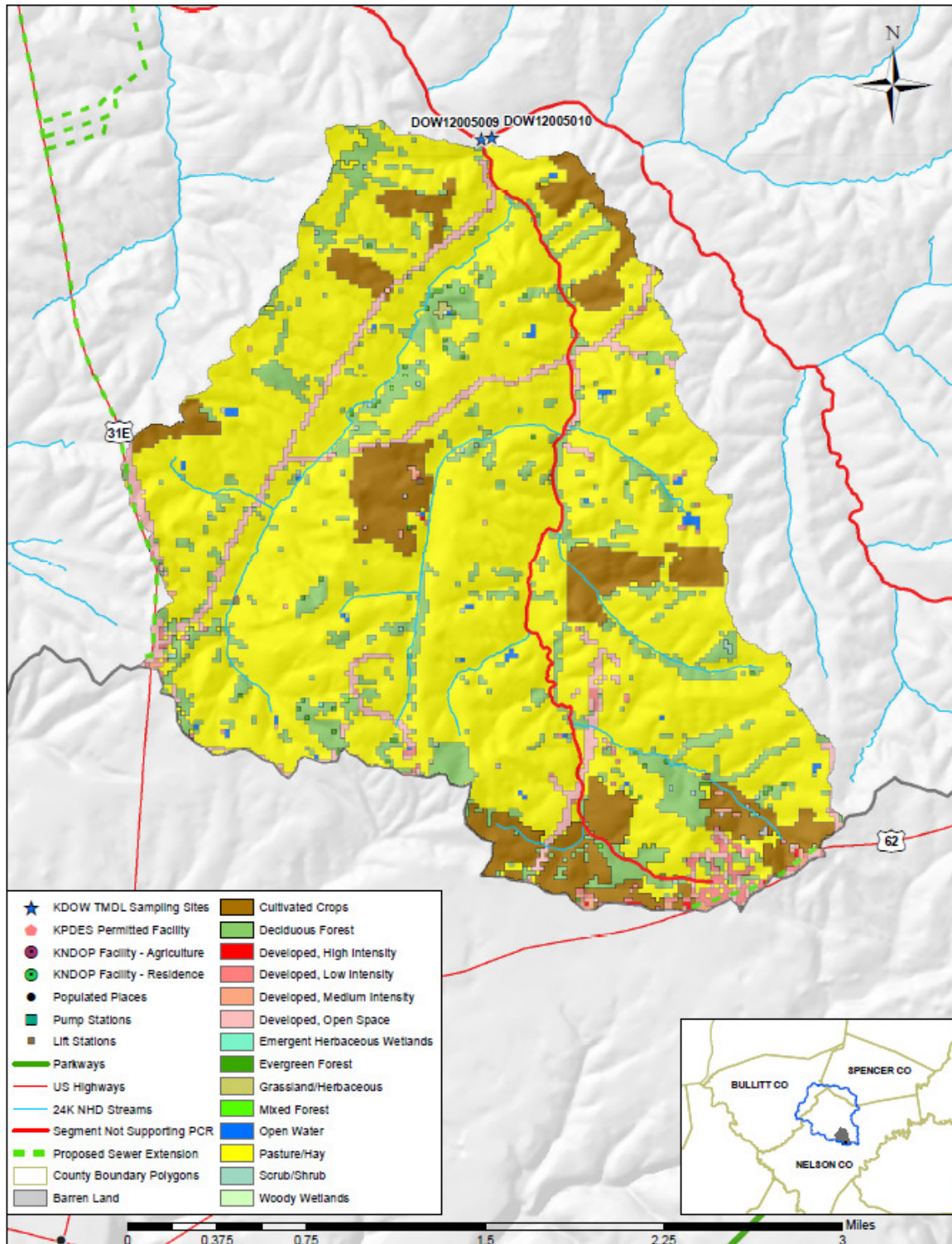


Figure 8.6 Land Cover for Caney Fork 0.0 to 4.0

Based on the WQC and the MAF, the *E. coli* TMDL for the 4.0 mile impaired segment of Caney Fork is 4.46×10^{10} colonies per day (Table 8.14). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.14 Summary of TMDL Components for Caney Fork 0.0 to 4.0

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
4.46×10 ¹⁰ col/day	4.46×10 ⁹ col/day	n/a	8.21×10 ⁷ col/day	4.02×10 ⁸ col/day	3.97×10 ¹⁰ col/day	7.6

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

8.2.1.6 Froman Creek 0.0 to 1.25 into Cox Creek

Froman Creek is a fourth order stream that discharges to Cox Creek near RM 11.3. There is one KPDES-permitted source (city of Bardstown MS4 community) and wastewater infrastructure including sewer lines and lift stations in the headwaters. There are no sewer lines throughout most of the subwatershed so residents must rely on OSTDS or do not treat their sewage. The subwatershed is largely agricultural pastureland (54.03%) followed by forest (36.22%; Figure 8.7). Exceedance of the WQC (240 col/100ml) was observed in 70% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.15). *E. coli* concentrations appear to increase with little or no precipitation suggesting contribution from various types of sources in the watershed such as aging/inadequate wastewater infrastructure, illegal straight-pipes, animals in streams or failing OSTDS.

Table 8.15 *E. coli* Data Collected for Froman Creek at Mobley Mill Road bridge (KY 509; RM 0.55) - DOW12005007

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	19.275	1553	heavy and steady rain in the last 48 hours, ~1"
05/13/09	16.922	579	About 3 days since last rainfall of 0.1"
06/02/09	0.874	20	About 4 days since last rainfall of 0.1"
06/09/09	0.781	64	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	548	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	7.756	>2419	Showers in the last 24 hours, ~0.1"
08/11/09	1.485	228	Showers in the last 24 hours, ~0.3"
09/22/09	0.245	430	Showers and rain in the last 48 hours, ~2.5"
10/13/09	6.055	687	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	21.630	687	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

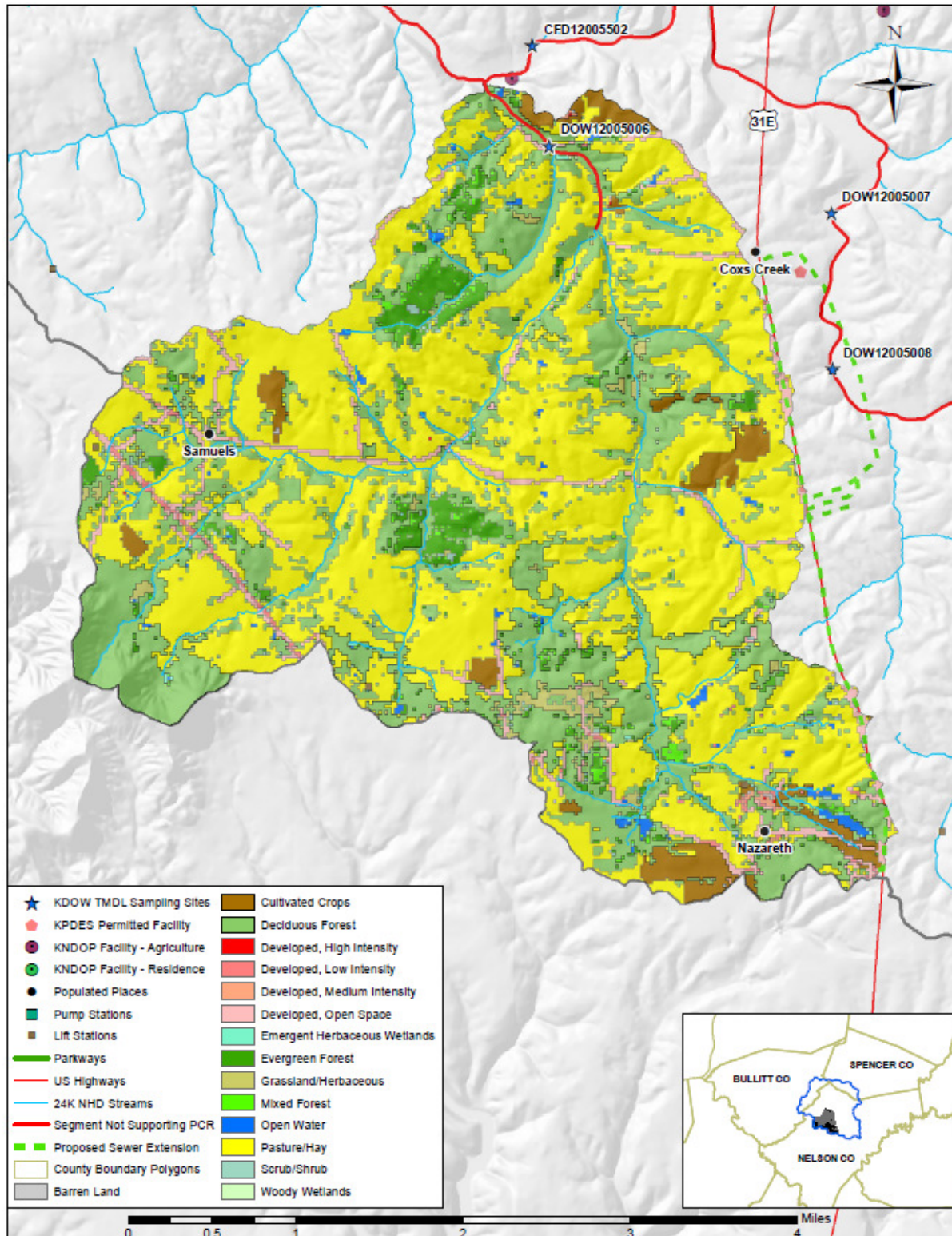


Figure 8.7 Land Cover for Froman Creek 0.0 to 1.25

Based on the WQC and the MAF, the *E. coli* TMDL for the 1.25 mile impaired segment of Froman Creek is 9.75×10^{10} colonies per day (Table 8.16). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.16 Summary of TMDL Components for Froman Creek 0.0 to 1.25

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
9.75×10 ¹⁰ col/day	9.75×10 ⁹ col/day	n/a	1.25×10 ⁸ col/day	4.39×10 ⁸ col/day	8.72×10 ¹⁰ col/day	16.6

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

8.2.1.7 West Fork Cox Creek 0.0 to 6.9 into Cox Creek

West Fork Cox Creek is a fourth order stream that discharges to Cox Creek near RM 4.7. There are two KNDOPs (Ulrich Dairy and Robinson Hog Farm) and three home units (permits 12005027, 12005029 and 12005026) but no KPDES-permitted sources in the subwatershed. There are no sewer lines so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by forest land (66.72%) followed by agricultural pastureland (19.03%; Figure 8.8). Exceedance of the WQC (240 col/100ml) was observed in 80% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.17). *E. coli* concentrations appear to increase with little to no precipitation suggesting contribution from various types of sources in the watershed such as animals in streams, illegal straight-pipes or failing OSTDS.

Table 8.17 *E. coli* Data Collected for West Fork Cox Creek at Lutz Lane bridge (RM 4.4) - DOW12005005

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	18.771	1203	heavy and steady rain in the last 48 hours, ~1"
05/13/09	8.327	326	About 3 days since last rainfall of 0.1"
06/02/09	0.681	214	About 4 days since last rainfall of 0.1"
06/09/09	0.679	106	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	1300	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	9.350	>2419	Showers in the last 24 hours, ~0.1"
08/11/09	2.019	461	Showers in the last 24 hours, ~0.3"
09/22/09	1.668	1260	Showers and rain in the last 48 hours, ~2.5"
10/13/09	6.488	770	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	15.546	866	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

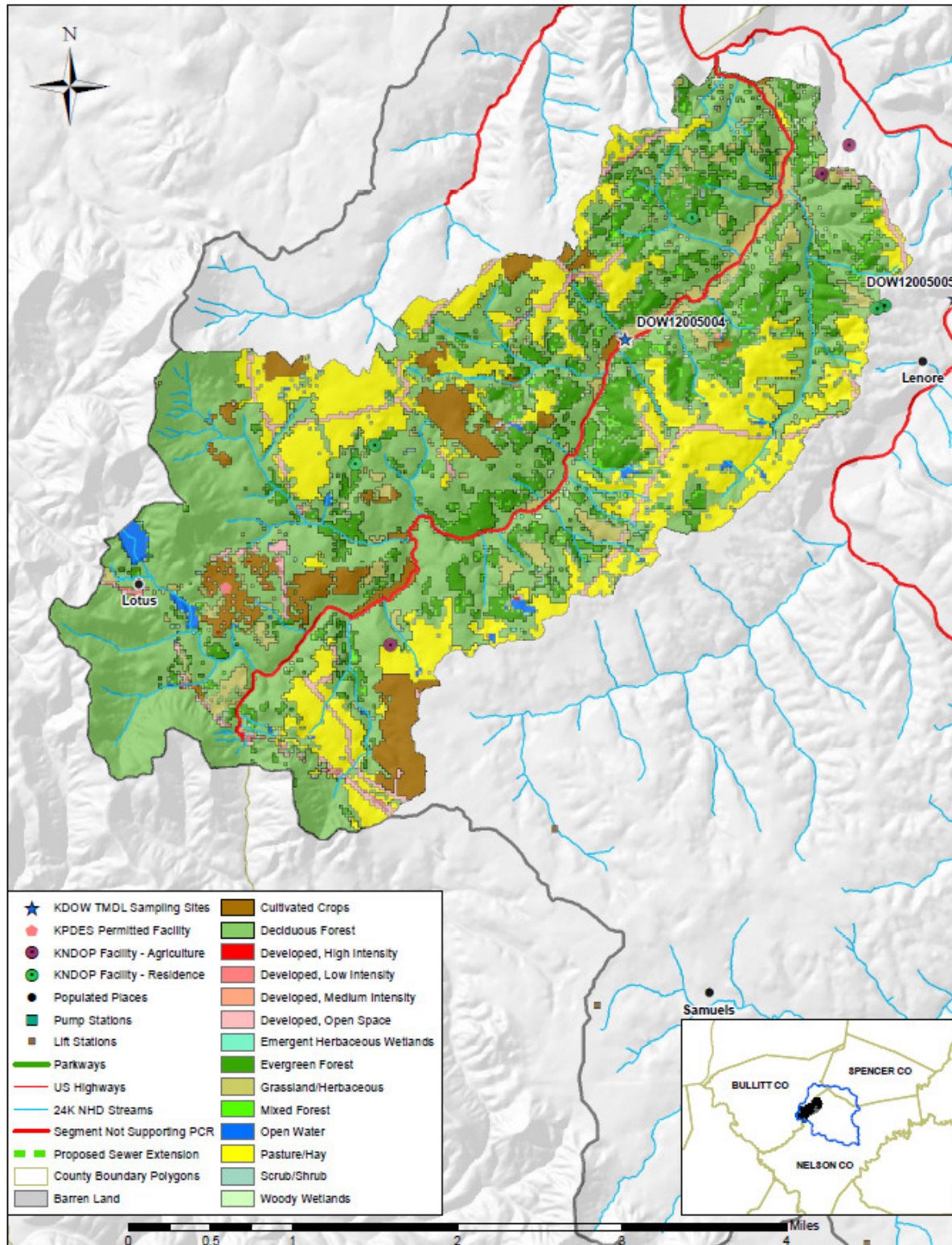


Figure 8.8 Land Cover for West Fork Cox Creek 0.0 to 6.9

Based on the WQC and the MAF, the *E. coli* TMDL for the 6.9 mile impaired segment of West Fork Cox Creek is 5.64×10^{10} colonies per day (Table 8.18). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.18 Summary of TMDL Components for West Fork Cox Creek 0.0 to 6.9

TMDL⁽¹⁾	MOS⁽²⁾	SWS-WLA⁽³⁾	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
5.64×10 ¹⁰ col/day	5.64×10 ⁹ col/day	n/a	n/a	2.54×10 ⁸ col/day	5.05×10 ¹⁰ col/day	9.6

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment

8.2.1.8 East Fork Cox Creek 0.0 to 4.3 into Cox Creek

East Fork Cox Creek is a fourth order stream that discharges to Cox Creek near RM 3.5. There are four KNDOPs (Lutz, Oliver Rogers, Robert Lutz and John McClaskey dairy farms) and five home units (permits 12006033, 12005032, 12005022, 12005018 and 12004019) but no KPDES-permitted sources in the subwatershed. There are no sewer lines so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by agricultural pastureland (49.51%) in the headwaters and forest land toward the mouth (34%; Figure 8.9). Exceedance of the WQC (240 col/100ml) was observed in 83.3% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.19). *E. coli* concentrations appear to increase with little to no precipitation suggesting contribution from various types of sources in the watershed such as animals in streams, illegal straight-pipes or failing OSTDS.

Table 8.19 *E. coli* Data Collected for East Fork Cox Creek off Grigsby Road (RM 0.6) - CFD12005502

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	28.275	2419	heavy and steady rain in the last 48 hours, ~1"
05/13/09	22.933	435	About 3 days since last rainfall of 0.1"
06/02/09	2.751	185	About 4 days since last rainfall of 0.1"
06/09/09	1.045	248	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	1986	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	8.580	1986	Showers in the last 24 hours, ~0.1"
08/11/09	2.812	166	Showers in the last 24 hours, ~0.3"
08/26/09	0.189	921	5 days since last rainfall of more than 0.1"
09/15/09	0.056	1414	7 days since last rainfall of more than 0.1"
09/22/09	2.641	2280	Showers and rain in the last 48 hours, ~2.5"
10/13/09	19.475	2419	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	57.378	>2419	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

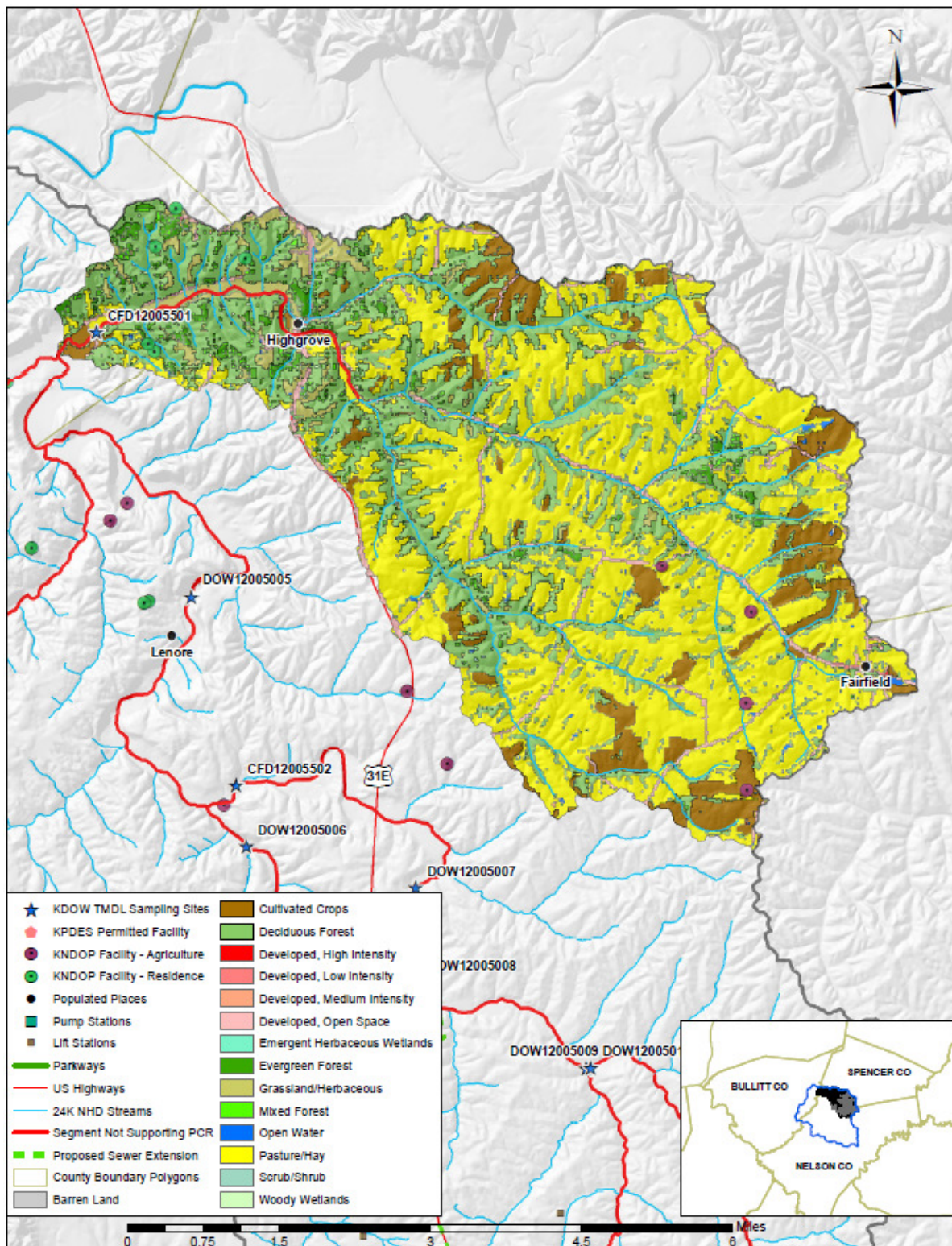


Figure 8.9 Land Cover for East Fork Cox Creek 0.0 to 4.3

Based on the WQC and the MAF, the *E. coli* TMDL for the 4.3 mile impaired segment of East Fork Cox Creek is 1.92×10^{11} colonies per day (Table 8.20). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.20 Summary of TMDL Components for East Fork Cox Creek 0.0 to 4.3

TMDL ⁽¹⁾	MOS ⁽²⁾	SWS-WLA ⁽³⁾	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
1.92×10^{11} col/day	1.92×10^{10} col/day	n/a	n/a	8.64×10^8 col/day	1.73×10^{11} col/day	32.7

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.
- (3). WLA value is based on design flow and acute permit limits and represents the maximum one-day load that can be discharged to the stream segment

8.2.1.9 Rocky Run 0.0 to 2.3 into Cox Creek

Rocky Run is a third order stream that discharges to Cox Creek near RM 2.2. There are no KPDES-permitted sources. There are no sewer lines so residents must rely on OSTDS or do not treat their sewage. The subwatershed is dominated by forest land (67.66%) followed by agricultural pastureland (17.71%; Figure 8.10). Exceedance of the WQC (240 col/100ml) was observed in 90% of the samples collected – the highest concentration of all samples was greater than 2,419 colonies per 100 ml (Table 8.21). *E. coli* concentrations appear to increase with little to no precipitation suggesting contribution from various types of sources in the watershed such as animals in streams, illegal straight-pipes or failing OSTDS.

Table 8.21 *E. coli* Data Collected for Rocky Run off Cedar Grove Road (RM 0.5) - DOW12005004

Collection Date	Discharge (cfs)	E Coli (CFU/100 ml)	Field Precipitation Notes
05/07/09	7.423	687	heavy and steady rain in the last 48 hours, ~1"
05/13/09	3.037	649	About 3 days since last rainfall of 0.1"
06/02/09	0.241	79	About 4 days since last rainfall of 0.1"
06/09/09	0.175	726	More than 5 days since last rainfall of more than 0.1"
06/22/09	n/a	980	Showers in the last 48 hours, ~0.5"; 4 days since last rainfall of 0.1"
07/29/09	4.052	>2419	Showers in the last 24 hours, ~0.1"
08/11/09	0.653	579	Showers in the last 24 hours, ~0.3"
09/22/09	0.347	1040	Showers and rain in the last 48 hours, ~2.5"
10/13/09	1.979	260	4 days since last rainfall; ~2.3" 10/8-9
10/29/09	5.274	435	Showers in the last 48 hours
Exceedance of WQC	Rain in last 24 hours	Rain in last 48 hours	No rain in last 48 hours

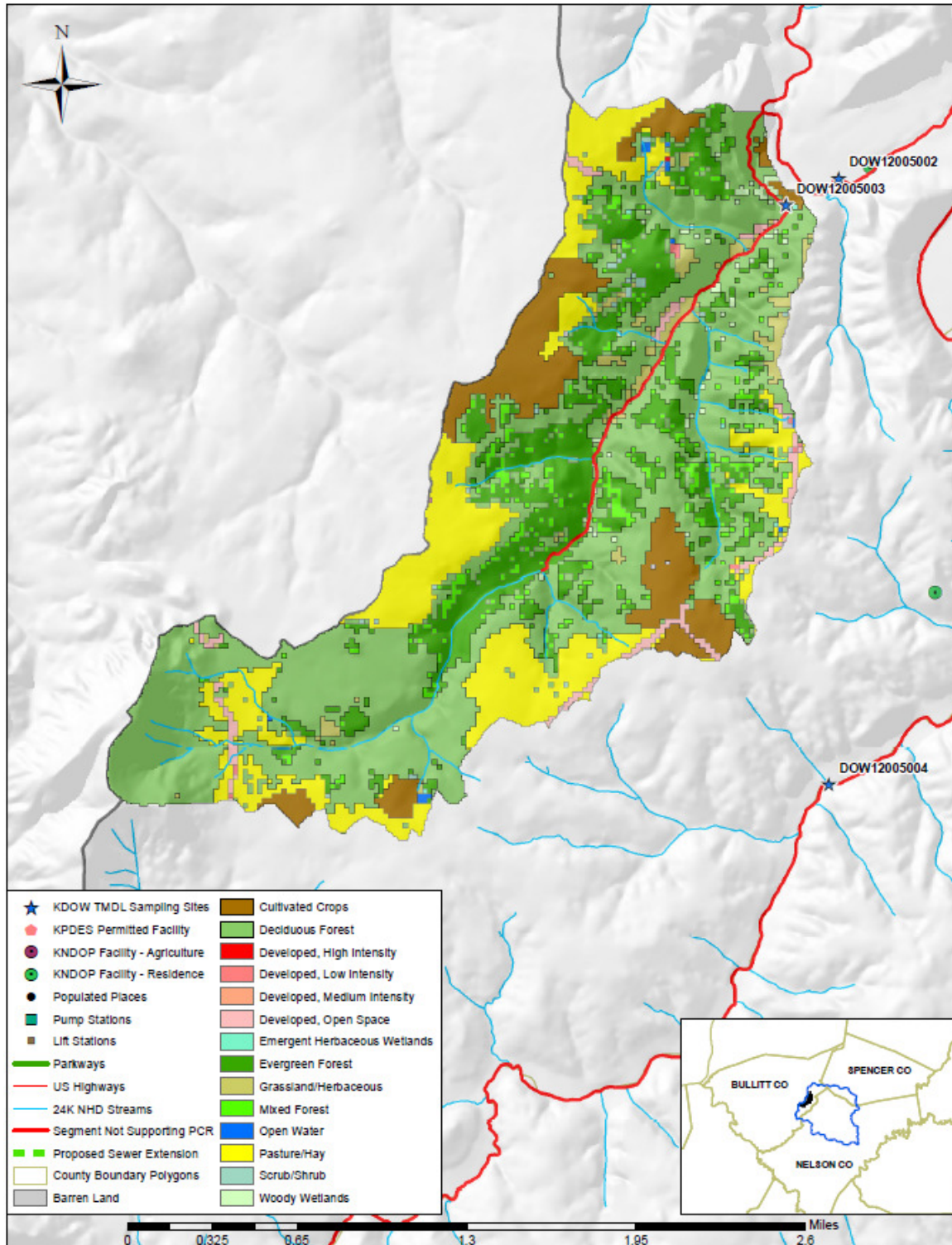


Figure 8.10 Land Cover for Rocky Run 0.0 to 2.3

Based on the WQC and the MAF, the *E. coli* TMDL for the 2.3 mile impaired segment of Rocky Run is 2.29×10^{10} colonies per day (Table 8.22). In addition, any future KPDES permitted sources must meet permit limits based on the WQC in 401 KAR 10:031 and must not cause or contribute to an existing impairment.

Table 8.22 Summary of TMDL Components for Rocky Run 0.0 to 2.3

TMDL⁽¹⁾	MOS⁽²⁾	SWS-WLA	MS4 - WLA	Future Growth - WLA	LA	Mean Annual Flow (cfs)
2.29×10 ¹⁰ col/day	2.29×10 ⁹ col/day	n/a	n/a	1.03×10 ⁸ col/day	2.05×10 ¹⁰ col/day	3.9

Notes:

- (1). The TMDL is the sum of all components. TMDLs are expressed as daily loads of *E. coli* colonies by multiplying the WQC by the MAF and appropriate conversion factors.
- (2). MOS is explicitly set at 10% of the WQC.

9.0 Implementation

Section 303(e) of the Clean Water Act and 40 CFR Part 130, Section 130.5, require states to have a continuing planning process (CPP) composed of several parts specified in the Act and the regulation. The CPP provides an outline of agency programs and the available authority to address water issues. Under the CPP umbrella, the Watershed Management Branch of KDOW will provide technical support and leadership with developing and implementing watershed plans to address water quality and quantity problems and threats. Developing watershed plans enables more effective targeting of limited restoration funds and resources, thus improving environmental benefit, protection and recovery.

Watershed plans provide an integrative approach for identifying and describing how, when, who and what actions should be taken in order to meet water quality standards. At this time, a comprehensive watershed restoration plan for the Cox Creek watershed has not been developed. This TMDL document provides bacteria allocations and reduction goals that may assist with developing a detailed watershed plan to guide watershed restoration efforts. In addition, the Cox Creek Watershed Health Report may also assist with development of a plan as it encourages public awareness and participation and highlights what can be done to help improve water quality such as

- keeping animals out of the stream,
- properly disposing of pet waste,
- reporting sewage leaks and overflows,
- working with local officials to extend or upgrade sewer service,
- properly maintaining septic systems and package treatment plants,
- leaving in place or establishing vegetation along the streams which provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, and absorb excess nutrients,
- limiting the use of chemicals, pesticides and fertilizers (or using them according to labels and soil test results),
- keeping storm drains clear of debris, trash or hazardous materials such as petroleum products and
- allowing fallen trees, other woody vegetation and gravel, cobble and boulders to remain in the stream to create habitat for aquatic life.

A watershed plan for the Cox Creek watershed should address both point and nonpoint sources of pollution in the watershed and should build on existing efforts as well as evaluate new approaches. Because of the specific landscape and location of the impairments in the Cox Creek watershed, a watershed plan should incorporate all available restoration and protection mechanisms, including any existing Groundwater Protection Plans, storm water or wastewater KPDES permits. A comprehensive watershed plan should consider both voluntary and regulatory approaches to meet water quality standards.

9.1 Kentucky Watershed Management Framework

A Watershed Management Framework approach to Water Quality Management was adopted by the KDOW in 1998. The plan divides Kentucky's major drainage basins into five groups of basins which are cycled through a five year staggered process that involves monitoring, assessment, prioritization, plan development, and plan implementation. As part of the process, a basin coordinator is assigned to each river basin to work with the citizens of the basin to develop a local Watershed Management Team associated with each priority watershed. For more information about the river basins see <http://water.ky.gov/watershed/Pages/Basins.aspx>.

9.2 Non-Governmental Organizations

There are several Non-Governmental Organizations (NGO) that may be operating in the Cox Creek watershed that may help to implement the TMDL, particularly with regard to nonpoint source issues. These organizations include Watershed Watch in Kentucky groups and Kentucky Waterways Alliance.

9.2.1 Watershed Watch in Kentucky

Watershed Watch is a citizen's water monitoring effort that relies exclusively on volunteers to provide administration, training, and volunteer and equipment coordination. The volunteers measure basic parameters of stream health to determine whether streams meet important "uses" under the Clean Water Act including aquatic life, human recreation, and drinking water.

Several water quality measurements are taken annually by Watershed Watch groups. Volunteers collect physical measurements, such as temperature, pH, dissolved oxygen, and conductivity. Stream monitoring may also include macroinvertebrate and habitat assessments. Data from annual monitoring is routinely used to help identify problems in the watershed, and assist with prioritizing streams for restoration and protection activities.

For more information about Watershed Watch see:
<http://water.ky.gov/wsw/Pages/default.aspx>.

9.2.2 Kentucky Waterways Alliance

The formation of Kentucky Waterways Alliance (KWA) was the result of a series of meetings sponsored by the Kentucky Environmental Quality Commission. The KWA has a mission to protect and restore Kentucky's waterways and their watersheds through alliances for watershed stewardship. This includes strengthening community and governmental stewardship for the restoration and preservation of Kentucky's water resources. The Alliance promotes networking, communication and mutual support among groups, government agencies, and businesses working on waterway issues.

For more information about KWA see:
<http://www.kwalliance.org>.

10.0 Public Participation

This TMDL document was published for a 30-day public comment period between November 21, 2012 and December 21, 2012. A public notice was sent to all newspapers in the Commonwealth of Kentucky and advertisements purchased in the Kentucky Standard and Pioneer News newspapers. Additionally, the public notice was distributed electronically through the 'Nonpoint Source Pollution Control' mailing list (<http://www.water.ky.gov/sw/nps/Mailing+List.htm>) of persons interested in water quality issues as well as the 'Press Release' mailing list maintained by the Governor's Office of media outlets across the Commonwealth.

Two comments were received during the public notice period that were incorporated into the administrative record for this TMDL. After consideration of the comments, revisions were made accordingly to the final TMDL document and responses prepared and mailed to the individuals participating in the public notice process. In addition, several residents of the watershed requested copies of the document and expressed interest in doing something to improve the water quality of the watershed. A public forum may be held in the future.

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Appendix A

- Land Use Analysis -

The land uses generated by the 2001 NLCD were consolidated for presentation purposes within the report. All forested land (deciduous, evergreen and mixed) and shrubbery was aggregated and reported as one category. Further, all residential land use area was aggregated and reported as one category; developed land. The NLCD returned small but positive values for three types of residential land uses—Developed Open Space, Low-Intensity Residential, and High-Intensity Residential. Developed Open Space is a term applied to differing types of land use, within urban areas it is the designation given to parkland and other green areas. However, in rural watersheds such as Cox Creek, it denotes residential areas with insufficient density to be classified as Low-Intensity Residential but is mainly composed of single family residences on large lots (James Seay, 2006, Personal Communication). Further descriptions of the NLCD classifications are provided below.

National Land Cover Database Class Descriptions (Homer et al, 2004)

(11) Open Water - All areas of open water, generally with less than 25% cover of vegetation or soil.

(21) Developed, Open Space - Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes

(22) Developed, Low Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.

(23) Developed, Medium Intensity - Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79 percent of the total cover. These areas most commonly include single-family housing units.

(24) Developed, High Intensity - Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

(31) Barren Land (Rock/Sand/Clay) - Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of total cover.

(41) Deciduous Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.

(42) Evergreen Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75 percent of the tree species maintain their leaves all year. Canopy is never without green foliage.

(43) Mixed Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75 percent of total tree cover.

(52) Shrub/Scrub - Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.

(71) Grassland/Herbaceous - Areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

(81) Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20 percent of total vegetation.

(82) Cultivated Crops - Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

(90) Woody Wetlands - Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

(95) Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Appendix B

- Cox Creek Watershed Health Report –

September 14th, 2010

Kentucky Division of Water
200 Fair Oaks Lane, 4th Floor
Frankfort, KY 40601
Phone: 502-564-3410
Website: <http://water.ky.gov>

Cox Creek Watershed Health Report

Department for Environmental Protection - Division of Water

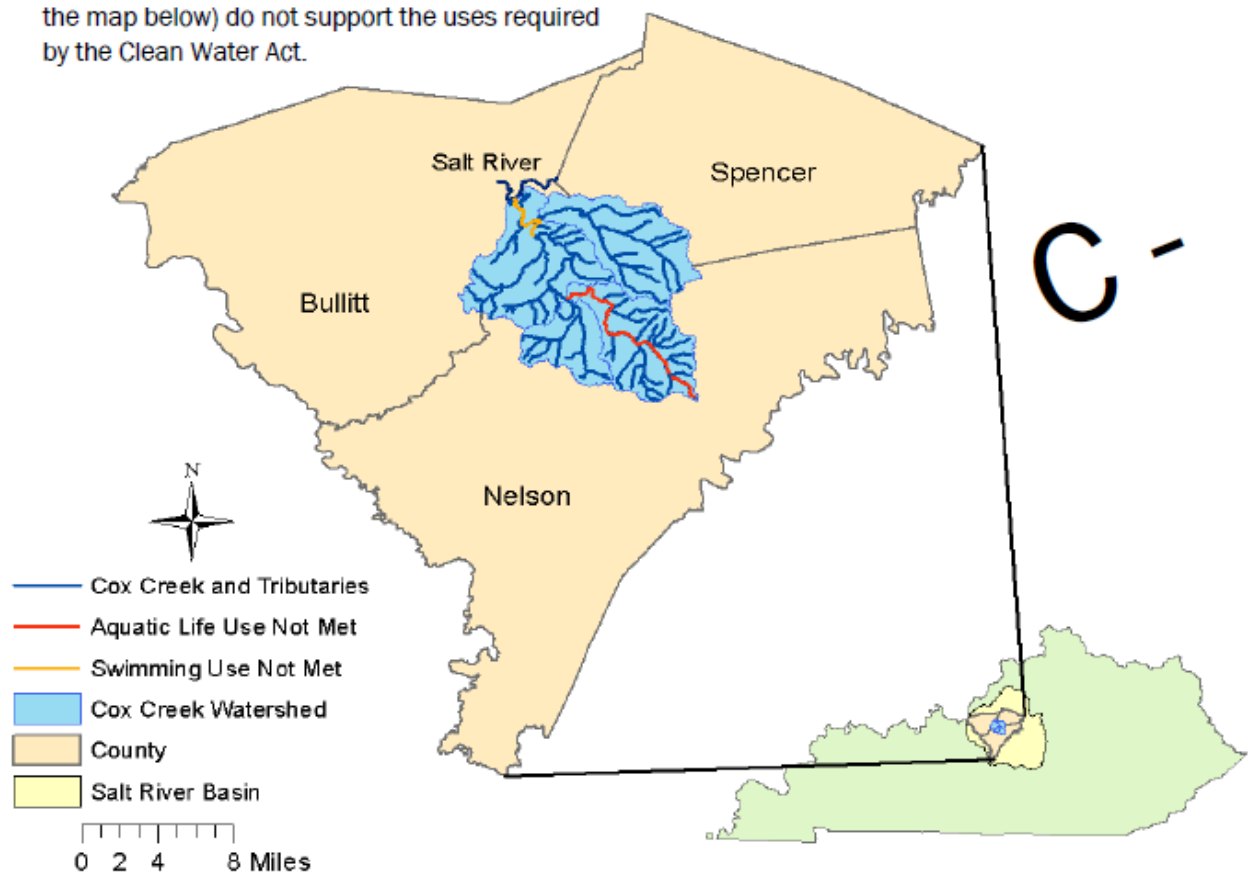
The Kentucky Division of Water (DOW) is the state agency responsible for carrying out the requirements of the Clean Water Act to reach the goal of making all waters in Kentucky safe for swimming and fishing (called **uses**).

DOW has developed this health report to inform the residents of Bullitt, Spencer and Nelson counties of efforts to examine the health of Cox Creek and the area of land that drains into Cox Creek, which is called a **watershed**.

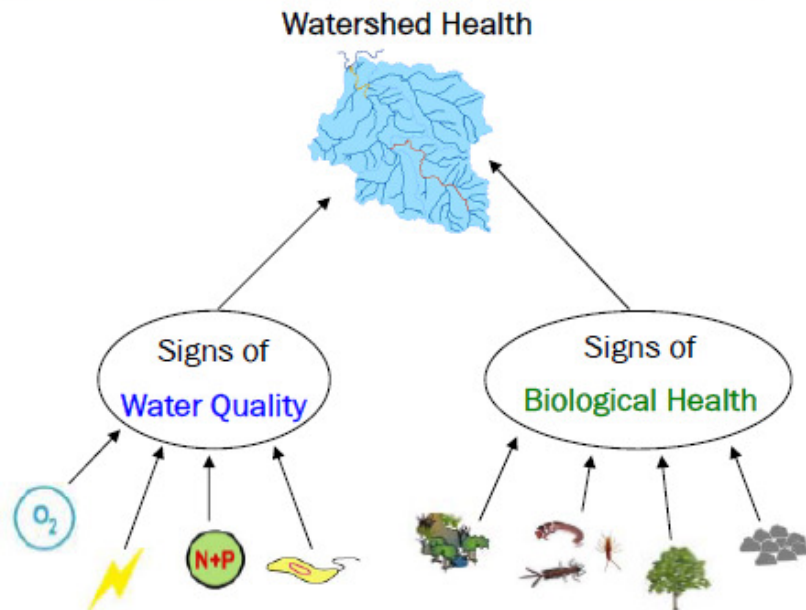
Upon initial evaluation, it was determined that parts of Cox Creek (shown in red and orange on the map below) do not support the uses required by the Clean Water Act.

The U.S. Environmental Protection Agency (EPA) requires that states conduct watershed studies on all such waters to calculate the maximum amount of pollution a creek can receive and still support a healthy watershed. This amount is known as a **Total Maximum Daily Load**, or TMDL.

Following a year-long study in 2009 by DOW to gather scientific data, the division has given a "report card grade" of a **C-** to the watershed. This health report explains the signs of health that went into assigning that grade and provides information on how the grade can be improved.



1. Data collected were divided into signs of **water quality** or signs of **biological health**.
2. Each sign received a grade, A through F, according to the results of our study, which were compared to health and science requirements and DOW scientific information.
3. The grades from each biological health sign were averaged to achieve a biological health score.
4. Similarly, each sign of water quality was averaged to achieve a water quality score.
5. These two scores were averaged to achieve a watershed health grade.



Signs of Water Quality



Dissolved Oxygen: Concentration of oxygen dissolved in water and readily available to fish and other aquatic organisms.



Specific Conductivity: A measure of the ability of water to conduct an electrical current, which is used for approximating the total dissolved solids content of water. Low specific conductivity is desired, and increasing specific conductivity negatively impacts fish and aquatic bugs.



Nitrogen and Phosphorus (Nutrients): Although natural sources of nutrients exist, major sources of nutrient pollution are typically caused by man's activities and include municipal sewage-treatment plants, industrial outflows, commercial fertilizers and animal waste.



E. Coli: A type of bacteria that lives in the intestinal tract of man and other warm-blooded animals. For a site to receive an F, the *E. coli* concentration was above the level considered safe for swimming 80 to 100 percent of the time.

Signs of Biological Health



Total Habitat: Stream habitat is assessed by scoring 10 habitat signs, which are both living and nonliving parts of the surroundings that support an organism, population or community.











Aquatic Macroinvertebrates (bugs): An animal without a backbone, large enough to be seen with the naked eye. They are often the immature forms of insects that live on land as adults and are an important food source for fish. Different species prefer different habitats, and some are more tolerant of pollution than others.



Riparian Zone: Land adjacent to a stream that has distinct soil types and plant communities, which aid in absorbing water and shading the stream. To receive an A, the riparian zone must be at least 18 yards wide on each side of the stream.

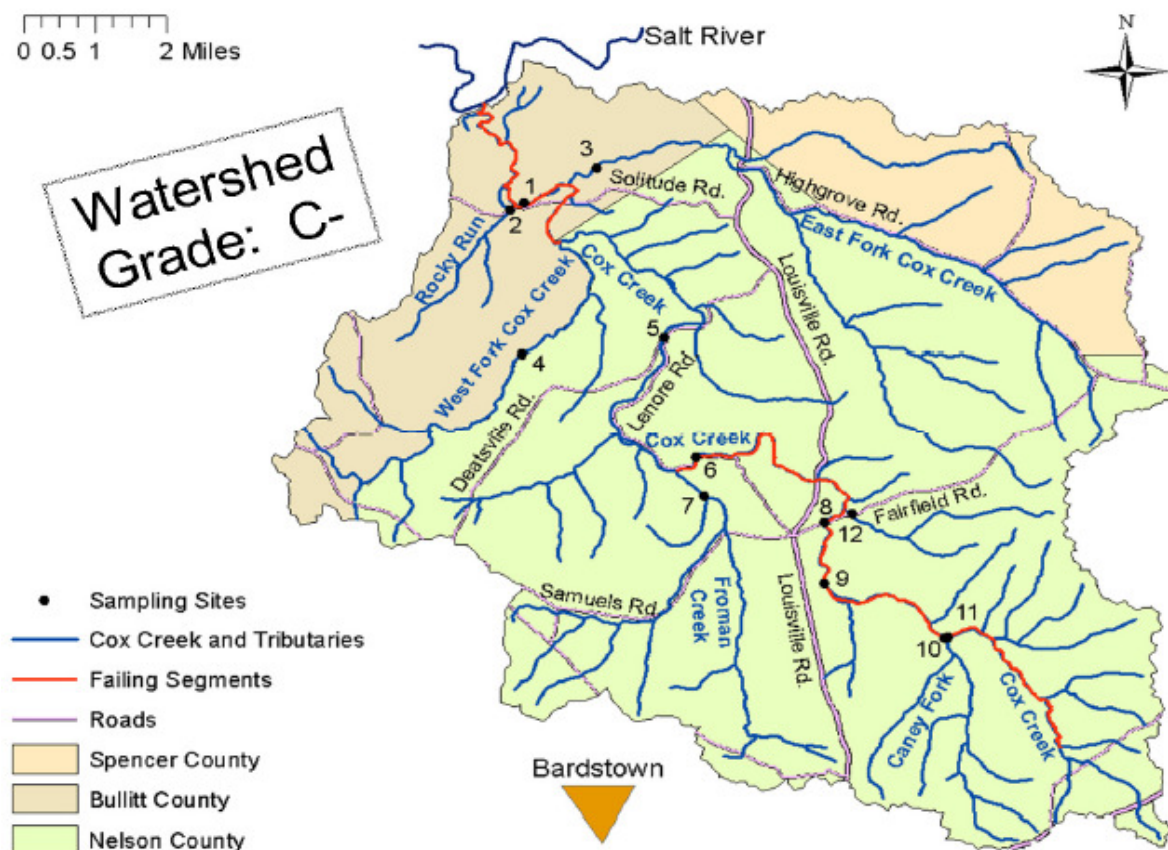


Available Cover: The quantity and variety of structures in the creek that provide a place for aquatic organisms to hide, feed, reproduce and raise young. Examples include cobble and boulders, fallen trees, logs, branches, root mats, undercut banks and aquatic vegetation.





DOW Number	Creek Name									Site Grade
1) DOW12005002	Cox Creek	B+	B+		F			D	F	D
2) DOW12005003	Rocky Run	A	C		F					C
3) CFD12005501	East Fork Cox Creek	B	B+		F			B	D	C
4) DOW12005004	West Fork Cox Creek	A	C		F			D	C	C-
5) DOW12005005	Cox Creek	D	B		F			D	D	D
6) CFD12005502	Cox Creek	C	B	C-	D	F	F	D	D	D
7) DOW12005006	Froman Creek	F+	B		D					C-
8) DOW12005007	Cox Creek	C	B	C-	F					C-
9) DOW12005008	Cox Creek	B	B	C-	D					C
10) DOW12005009	Caney Fork	C	B	C	F	D	F	C	F	D+
11) DOW12005010	Cox Creek	D+	B	C-	F	F	D	D	D	D
12) DOW12005001	Cox Creek UT					F	A	B	C	C+

0 0.5 1 2 Miles

**Watershed
Grade: C-**



Summary: Room for Improvement

POSITIVES	NEGATIVES	GRAY AREA
 <p>* Specific conductivity was fairly good, indicating reasonably low dissolved solids.</p>  <p>* Dissolved oxygen (DO) levels were, for the most part, suitable for fish and bugs. Lower DO grades at a few sites probably resulted from over growth of algae that occurs when loss of tree cover reduces stream shading and nutrients runoff into streams.</p>	 <p>* From May to November 2009, 8 of the 11 sites had <i>E. coli</i> concentrations above the safe standard for swimming 80 to 100 percent of the time. These levels may cause gastrointestinal illness if the water is swallowed or infection if contact is made with an open sore or wound.</p> <p>* Decreasing numbers and types of fish and bugs were related to loss of habitat, riparian zone and cover. This cover provides habitat for beneficial bacteria, which are eaten by the bugs that are then eaten by the fish. This cover also provides habitat for fish and bugs to live, feed, mate and hide from predators.</p> <p>* Rising water temperatures due to loss of shading when trees are cut and banks cleared.</p>	 <p>* For the most part, nitrogen and phosphorous levels were reasonable but rose following rain events due to pollution entering the stream with runoff or sewer overflow.</p> <p>* To reduce these periodic increases in nutrients, land management should include introduction of permeable surfaces, sewer line extension, use of rain barrels and rain gardens, increased stream bank vegetation and correct use of fertilizers.</p>

What can you do?

<ul style="list-style-type: none"> • Trees are the best way to protect and restore water quality and biological health. <ul style="list-style-type: none"> ◊ Leave in place or establish vegetation alongside streams to provide natural filters that stabilize stream banks, minimize erosion, regulate water flow, provide shade, and absorb excess nutrients. ◊ Plant trees and do not mow within 18 yards of the stream bank. • To keep water safe for swimming, keep animals out of the streams, which will limit the amount of animal waste entering the waterways, reduce excess nutrients, and protect habitat. • To improve habitat, allow fallen trees, logs, leaves, gravel, cobble and boulders to remain in the stream to create habitat for fish and bugs to feed, find refuge and reproduce. 	<ul style="list-style-type: none"> • To reduce nutrients <ul style="list-style-type: none"> ◊ Use chemicals and pesticides according to labels and fertilizers based on soil test results. Limit uses and store and dispose of properly. ◊ Report sewer leaks and overflow problems. ◊ Properly dispose of pet waste. • Keep grass clippings, petroleum products, trash, and litter out of storm drains; this material enters the stream directly without treatment. • Service your vehicle regularly to prevent oil and anti-freeze leaks and reduce noxious emissions. • Become a certified citizen volunteer water quality monitor or establish a program in your local community or watershed. • Talk to your local legislators about improving the health of your watershed. Stress the importance of land management as land is developed.
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Where to go for more information

<p>Volunteering</p> <p>* Watershed Watch in Kentucky: water.ky.gov/wsw/Pages/default.aspx or contact Jo Ann Palmer at 800-928-0045 or JoAnn.Palmer@ky.gov</p> <p>Purchasing or planting native trees and plants</p> <p>* Division of Forestry: forestry.ky.gov/Pages/default.aspx</p> <p>* Kentucky Native Plant Society: www.knps.org/plant_resources.html</p>	<p>Grants and programs</p> <p>* KY's Nonpoint Source (Runoff) Pollution program: water.ky.gov/nsp/Pages/default.aspx</p> <p>* KY's Natural Resource Conservation Service: www.ky.nrcs.usda.gov/</p> <p>* KY's 319 Grant program: water.ky.gov/Funding/Pages/NonpointSource.aspx or contact James Roe at 502-564-3410 or James.Roe@ky.gov</p> <p>Making changes at home and work</p> <p>* Bluegrass PRIDE: www.bgpride.org/gallery1.htm</p>
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Appendix C

- Discharge Monitoring Report (DMR) Information for KPDES-permitted Sources -

DMR Numeric Violations

Nitrogen, ammonia total

NPDES ID	Monitoring	Outfall	Limit Set	DMR Value	Limit Value	Limit Units
KY0096075	8/1/2007	001	1-SANITARY WASTEWATER	6.9	4.	Milligrams per Liter
KY0096075	9/1/2007	001	1-SANITARY WASTEWATER	6.9	4.	Milligrams per Liter
KY0096075	10/1/2007	001	1-SANITARY WASTEWATER	6.9	4.	Milligrams per Liter
KY0096075	5/1/2008	001	1-SANITARY WASTEWATER	4.6	4.	Milligrams per Liter
KY0096075	8/1/2008	001	1-SANITARY WASTEWATER	4.1	4.	Milligrams per Liter
KY0096075	7/1/2011	001	1-SANITARY DISCHARGE	7.2	4.	Milligrams per Liter
KY0096075	7/1/2011	001	1-SANITARY DISCHARGE	7.2	6.	Milligrams per Liter

Phosphorous, total

NPDES ID	Monitoring	Outfall	Limit Set	DMR Value	Limit Value	Limit Units
KY0096075	7/1/2009	001	1-SANITARY DISCHARGE	7.48	1.	Milligrams per Liter
KY0096075	10/1/2009	001	1-SANITARY DISCHARGE	7.48	1.	Milligrams per Liter
KY0096075	1/1/2010	001	1-SANITARY DISCHARGE	3.15	1.	Milligrams per Liter
KY0096075	4/1/2010	001	1-SANITARY DISCHARGE	6.13	1.	Milligrams per Liter
KY0096075	7/1/2010	001	1-SANITARY DISCHARGE	7.63	1.	Milligrams per Liter
KY0096075	10/1/2010	001	1-SANITARY DISCHARGE	3.28	1.	Milligrams per Liter
KY0096075	7/1/2011	001	1-SANITARY DISCHARGE	4.02	1.	Milligrams per Liter

Solids, total suspended

NPDES ID	Monitoring	Outfall	Limit Set	DMR Value	Limit Value	Limit Units
KY0096075	7/1/2009	001	1-SANITARY DISCHARGE	50	30.	Milligrams per Liter

Appendix D

- WRIS Reports -

The following paragraphs explaining the WRIS and WRIS portal were copied from their website in July 2012 and can be accessed at <http://kia.ky.gov/wris/>.

The Water Resource Information System (WRIS) has been developed through the cooperative efforts of water and wastewater treatment systems and local, regional, and state agencies. It is used by all these entities, and provides much of the information needed for all aspects of water resource planning--from watershed protection to infrastructure development. The WRIS includes a geographic information system (GIS), and information on water resources, drinking water systems, wastewater treatment systems, project development, emergency response, regulations, and planning.

The WRIS is comprised of strategic plans, water resource maps and publications, systems management information, reporting and regulatory requirements, guidance and training documents, procedural guidance and forms for project implementation and funding, and internet links to support services. Interactive maps in the system support planning and regionalization efforts. The interactive maps also facilitate drought monitoring and response, and rapid response to contamination emergencies. The GIS contains data for water and wastewater treatment facilities, water lines, water sources, storage facilities, sewer lines, and a database of non-spatial systems information. The GIS provides the fundamental data needed for the planning and emergency response activities. Using the GIS infrastructure data in computer models allows for cost-effective analysis of engineering alternatives, and facilitates the efficiencies needed to meet the needs of Kentucky's infrastructure development.

WRIS system reports can be generated using system data accessed via the WRIS portal. Likewise project profile forms can be generated using project profile data accessed via the WRIS portal. There are two permitted wastewater systems that have sanitary sewer collection infrastructure within the Cox Creek watershed but do not discharge to any of its waters. The city of Bardstown operates a sanitary sewer collection system and six lift stations within upper Cox, Froman and Caney Creeks. This wastewater is treated at the Bardstown Wastewater Treatment Plant. The city of Bloomfield, located less than five miles to the east, operates one pump station in the headwaters of Cox Creek. Wastewater from this station is treated at the Bloomfield Sewage Treatment Plant. Both systems have several projects on the Clean Water State Revolving Fund List. These projects include sewer line extensions and pump station upgrade and construction. One of these projects involves extending the Bardstown sanitary sewer collection system to Cox Creek Elementary school in order to eliminate its 'inadequate package treatment plant'. These systems and projects are discussed further in Sections 5 and 8 of the document. The WRIS system reports and project profiles are included below.



WRIS System Data Report

KY0021237 - Bardstown Sewer System



DOW Permit ID: **KY0021237** [Link: EPA PCS Report](#)
DOW Permit Type: **WASTE WATER (KPDES)** [Link: EPA ECHO Report](#)
DOW Permit Name: **Bardstown STP**
WRIS System Name: **Bardstown Sewer System**
KPDES Public
System Type: **Wastewater** Receiving Waters: **Town Crk & Rowan Crk Junction**
ADD ID: **LTADD** Primary County: **Nelson** Dow Field Office: **Columbia**
Permit Dates: Issued: **06.23.2005** Expired: **07.31.2010** Inactivated:

SYSTEM CONTACT INFORMATION

Contact: **Larry Hamilton**
Title: **Public Works Director**
Address Line 1: **220 N Fifth St**
Address Line 2:
City **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Email: lahamilton@bardstowncable.net
Data Source: **KENTUCKY INFRASTRUCTURE AUTHORITY**

Date Last Modified: 06.04.2010

OWNER ENTITY INFORMATION

Entity Type: **City / Municipal Utility** PSC Group ID: **8800300**
Entity Name: **City of Bardstown**
Web URL:
Office Email: bbryant@bardstowncable.net
Office Phone: **502-348-5947** Toll Free: Fax: **502-348-2433**

Mail Address Line 1: 220 N Fifth St	Phys Address Line 1:
Mail Address Line 2:	Phys Address Line 2:
Mail City, State Zip: Bardstown, KY 40004	Phys City, State Zip:
Contact: Bobbe Blincoe	Manager: Larry Hamilton
Contact Title: City Clerk	Manager Title: Public Works Director
Contact Email: bblincoe@bardstowncable.net	Manager Email: lahamilton@bardstowncable.net
Contact Phone: 502-331-7006	Manager Phone: 502-331-7087
Contact Cell:	Manager Cell:

Authorized Official: **William S Sheckles**
Auth. Official Title: **Mayor**
Auth. Official Email: mayorsheckles@bardstowncable.net
Auth. Official Phone: **502-331-7007** Auth. Official Cell:

Data Source: **KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT**

Date Last Modified: 09.12.2012

DEMOGRAPHIC INFORMATION

Counties Directly Served: **1**
Directly Serviceable Population: **21,621**
Indirectly Serviceable Population:
Total Serviceable Population: **21,621**

County Served	Connection Count	Serviceable Population
Nelson	6,900	21,621
Totals	6,900	21,621

Note: Population counts are based on KIA census block overlay with WRIS mapped features.

System Respondent

ADD WMP

Date

WRIS System Data Report

KY0021237 - Bardstown Sewer System

DOW Permit ID: KY0021237	Link: EPA PCS Report
DOW Permit Type: WASTE WATER (KPDES)	Link: EPA ECHO Report
DOW Permit Name: Bardstown STP	
WRIS System Name: Bardstown Sewer System	
System Type: KPDES Public Wastewater	Receiving Waters: Town Crk & Rowan Crk Junction
ADD ID: LTADD	Primary County: Nelson Dow Field Office: Columbia
Permit Dates: Issued: 06.23.2005	Expired: 07.31.2010 Inactivated:

FISCAL ATTRIBUTES

Date Established: **01.01.1960** Employees: **2**

Does this system:

- | | |
|---|------------|
| (a) Operate a wastewater treatment facility? | Yes |
| (b) Send wastewater to other systems to be treated? | No |
| (c) Treat wastewater from other systems? | No |

What is the customer cost per 4,000 gallons of treated water? **\$18.02**

Comments:

Date Last Modified: **06.29.2010**

WRIS System Data Report

KY0021237 - Bardstown Sewer System

DOW Permit ID: **KY0021237**
DOW Permit Type: **WASTE WATER (KPDES)**
DOW Permit Name: **Bardstown STP**
WRIS System Name: **Bardstown Sewer System**

[Link: EPA PCS Report](#)
[Link: EPA ECHO Report](#)

System Type: **Wastewater** Receiving Waters: **Town Crk & Rowan Crk Junction**
ADD ID: **LTADD** Primary County: **Nelson** Dow Field Office: **Columbia**
Permit Dates: Issued: **06.23.2005** Expired: **07.31.2010** Inactivated:

SYSTEM PLANNING

Wastewater Treatment Plants (KIA):

Facility Name	Design Capacity (MGD)	Max Hydr. Capacity (MGD)	Ave. Daily Flow (MGD)
BARDSTOWN WWTP	3.000	3.000	2.500

✓ This system has an approved facility plan.

Estimated percentage of facility plan constructed: %

Date facility plan last revised or amended: **01.01.2002**

Number of manholes in collection system:

Percentage of sewer lines 20 years or older: **60**

DOW Design Capacity (MGD): **3.000**

Annual Volume Treated (MG): **436.800**

KISOP Volume Sent (MG):

Total Annual Volume (MG): **436.800**

KISOP Customers:

Residential Customers: **6,678**

Commercial Customers:

Institutional Customers:

Industrial Customers: **22**

Other Customers: **200**

Total Customers: **6,900**

Comments:

Date Last Modified: 06.29.2010

WMP Site Visit - Survey Information:

Site Visit / Survey Date: **10.17.2011**

Survey Administrator: **LTADD**

Principal Respondent: **Larry Hamilton**

Other Respondent(s): **Jessica Filiatreau**

Comments: **Jessica Filiatreau has joined the City's staff.**

Date Last Modified: 04.10.2012

WRIS System Data Report

KY0021237 - Bardstown Sewer System

DOW Permit ID: **KY0021237**
DOW Permit Type: **WASTE WATER (KPDES)**
DOW Permit Name: **Bardstown STP**
WRIS System Name: **Bardstown Sewer System**

[Link: EPA PCS Report](#)
[Link: EPA ECHO Report](#)

System Type: **Wastewater** Receiving Waters: **Town Crk & Rowan Crk Junction**
ADD ID: **LTADD** Primary County: **Nelson** Dow Field Office: **Columbia**
Permit Dates: Issued: **06.23.2005** Expired: **07.31.2010** Inactivated:

SYSTEM MAINTENANCE

This system has a policy manual in place containing the following items:

- | | |
|--|---------------------------------|
| ✓ Personnel Policies | ✓ Standard Operating Procedures |
| ✓ Operation and Maintenance Procedures | ✓ Routine Maintenance Program |
| ✓ Emergency Operation Procedures | ✓ Backup Sources |

- ✓ The management of this system participates in regular training activities.
- ✓ System operator(s) participate in regular training activities.
- ✓ This system utilizes standard specifications.

Date standard specifications last revised:

Date of last infiltration analysis: **01.01.2006**

- ✓ This system has periodic service outages.
Cause(s): **Storms - substation failures**
- ✓ This system experiences problematic weather.
Weather: **Severe storms can cause isolated short - term outages**
- ✓ This system has localized problems.

The following components are associated with localized problems:

Problem location(s): **Low lying areas**

Problem diameter(s): **0**

Problem Material(s): **Clay**

Problem cause(s):

Other problem characteristics:

- ✓ This system has as-built plans (record drawings).
Est. degree of accuracy for as-built plans (%):
- ✓ This system uses an on-staff inspector(s) for construction projects.

Date of last infiltration analysis: **01.01.2006**

Maintenance notes for this system:

Date Last Modified: 06.29.2010

WRIS System Data Report

KY0021237 - Bardstown Sewer System

The following projects are associated with this system:

PNUM	Applicant	Project Status	Funding Status	Schedule	Project Title	Profile Modified	GIS Modified
SX21179008	City of Bloomfield	Approved	Fully Funded	0-2 Years	Bloomfield Pump Station and Forcemain to Bardstown	04.10.2012	09.21.2010
SX21179014	City of Bardstown	Approved	Not Funded	3-5 Years	BARDSTOWN COX	07.29.2011	09.21.2010
SX21179016	City of Bardstown	Approved	Partially Funded	3-5 Years	City of Bardstown-Town Creek Interceptor	04.10.2012	09.21.2010
SX21179018	Nelson County Fiscal Court	Approved	Not Funded	0-2 Years	NELSON COUNTY INDUSTRIAL PARK WASTEWATER PROJECT	07.29.2011	09.21.2010
SX21179019	City of Bardstown	Approved	Fully Funded	0-2 Years	BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT	04.10.2012	09.21.2010
SX21179024	City of Bardstown	Approved	Not Funded	0-2 Years	Bardstown SSES	09.07.2012	09.21.2010

WRIS System Data Report

KY0096075 - Coxs Creek Elementary School

DOW Permit ID: KY0096075		Link: EPA PCS Report
DOW Permit Type: WASTE WATER (KPDES)		Link: EPA ECHO Report
DOW Permit Name: Coxs Creek Elem School		
WRIS System Name: Coxs Creek Elementary School		
<div style="display: flex; justify-content: space-between;"> <div> KPDES Non-Public System Type: Wastewater </div> <div> Receiving Waters: Coxs Crk Primary County: Nelson Dow Field Office: Columbia </div> </div>		
<div style="display: flex; justify-content: space-between;"> <div> ADD ID: LTADD Permit Dates: Issued: 03.27.2009 </div> <div> Expired: 04.30.2014 Inactivated: </div> </div>		

SYSTEM CONTACT INFORMATION

Contact: **Charles Thompson**
Title:
Address Line 1: **Nelson Co Bd of Ed**
Address Line 2: **1200 Cardinal Dr**
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-349-0951** Email:
Data Source: **KENTUCKY DIVISION OF WATER**

Date Last Modified: 06.03.2010

OWNER ENTITY INFORMATION

Entity Type: School	PSC Group ID:
Entity Name: Coxs Creek Elementary School	
Web URL:	
Office Email:	
Office Phone: 502-349-7050	Toll Free: Fax: 502-349-7024
Mail Address Line 1: 5635 Louisville Rd	Phys Address Line 1: 5635 Louisville Rd
Mail Address Line 2:	Phys Address Line 2:
Mail City, State Zip: Coxs Creek, KY 40013	Phys City, State Zip: Coxs Creek, KY 40013
Contact: Jan Lanham	Manager: Jan Lanham
Contact Title: School Principal	Manager Title: School Principal
Contact EMail: jan.lanham@nelson.kyschools.us	Manager EMail: jan.lanham@nelson.kyschools.us
Contact Phone: 502-349-7050	Manager Phone: 502-349-7050
Contact Cell:	Manager Cell:

Authorized Official: **Anthony Orr**
Auth. Official Title: **School District Superintendent**
Auth. Official EMail: **anthony.orr@nelson.kyschools.us**
Auth. Official Phone: **502-349-7000**

Auth. Official Cell:

Data Source: **KENTUCKY DEPARTMENT OF EDUCATION**

Date Last Modified: 09.12.2012

DEMOGRAPHIC INFORMATION

Counties Directly Served: **1**
Directly Serviceable Population: **155**
Indirectly Serviceable Population:
Total Serviceable Population: **155**

County Served	Connection Count	Serviceable Population
Nelson	1	155
Totals	1	155

Note: Population counts are based on KIA census block overlay with WRIS mapped features.

WRIS System Data Report

KY0096075 - Coss Creek Elementary School

System Respondent	ADD WMP	Date
-------------------	---------	------

FISCAL ATTRIBUTES

Date Established: 01.01.1992 Employees: 3

Does this system:

- | | |
|---|-----|
| (a) Operate a wastewater treatment facility? | Yes |
| (b) Send wastewater to other systems to be treated? | No |
| (c) Treat wastewater from other systems? | No |

What is the customer cost per 4,000 gallons of treated water? \$0.00

Comments:

Date Last Modified:

SYSTEM PLANNING

☐ This system has an approved facility plan.

Estimated percentage of facility plan constructed: %

Date facility plan last revised or amended:

Number of manholes in collection system: 3

Percentage of sewer lines 20 years or older:

DOW Design Capacity (MGD): 0.010

Annual Volume Treated (MG):

KISOP Volume Sent (MG):

Total Annual Volume (MG):

KISOP Customers:

Residential Customers:

Commercial Customers:

Institutional Customers: 1

Industrial Customers:

Other Customers:

Total Customers: 1

Comments:

Date Last Modified: 05.23.2002

WMP Site Visit - Survey Information:

Site Visit / Survey Date:

Survey Administrator: Ltadd

Principal Respondent: John Ray Ball

Other Respondent(s):

Comments: Recommend -Wet land for schools, less maintenance school operation is unpredictable since school is not in session at various times of year. there is no flow and this makes it almost impossible to keep in compliance without feeding your plant.

Date Last Modified: 05.23.2002

WRIS System Data Report

KY0096075 - Coxs Creek Elementary School

DOW Permit ID: KY0096075		Link: EPA PCS Report
DOW Permit Type: WASTE WATER (KPDES)		Link: EPA ECHO Report
DOW Permit Name: Coxs Creek Elem School		
WRIS System Name: Coxs Creek Elementary School		
KPDES		
Non-Public		
System Type: Wastewater	Receiving Waters: Coxs Crk	
ADD ID: LTADD	Primary County: Nelson	Dow Field Office: Columbia
Permit Dates: Issued: 03.27.2009	Expired: 04.30.2014	Inactivated:

SYSTEM MAINTENANCE

This system has a policy manual in place containing the following items:

- | | |
|--|--|
| <ul style="list-style-type: none"> ✓ Personnel Policies ✓ Operation and Maintenance Procedures ✓ Emergency Operation Procedures | <ul style="list-style-type: none"> ✓ Standard Operating Procedures ✓ Routine Maintenance Program ✓ Backup Sources |
|--|--|

☐ The management of this system participates in regular training activities.

✓ System operator(s) participate in regular training activities.

✓ This system utilizes standard specifications.

Date standard specifications last revised: **05.01.2001**

Date of last infiltration analysis:

✓ This system has periodic service outages.

Cause(s): **Weather**

✓ This system experiences problematic weather.

Weather: **Severe winter weather (ice storms)**

☐ This system has localized problems.

The following components are associated with localized problems:

Problem location(s):

Problem diameter(s):

Problem Material(s):

Problem cause(s):

Other problem characteristics:

✓ This system has as-built plans (record drawings).

Est. degree of accuracy for as-built plans (%):

☐ This system uses an on-staff inspector(s) for construction projects.

Date of last infiltration analysis:

Maintenance notes for this system:

Date Last Modified: 05.23.2002



Clean Water Project Profile

Legal Applicant:	City of Bloomfield	
Project Title:	Bloomfield Pump Station and Forcemain to Bardstown	
Project Number:	SX21179008	View Map
Funding Status:	Fully Funded	Submitted By: LTADD
Project Status:	Approved	Primary County: Nelson
Project Schedule:	0-2 Years	Planning Unit: Nelson
E-Clearinghouse SAI:	KY200806240782	Multi-County: No
Applicant Entity Type:	City / Municipal Utility	ECH Status: Endorse With Condition
Date Approved (AWMPC):	06-14-2005	

Project Description:

This proposed transport system includes the construction of a new pump station located at the site of the existing Bloomfield WWTP. The pump station would be designed to pump 1,000Gpm of wastewater from the Bloomfield collection system. The pump station would utilize a 12-inch force main from Bloomfield to Bardstown along KY Hwy 62, approx. 11 miles. It would connect with the Bardstown collection system at the existing town creek interceptor (Hwy 162). This project would allow for the removal of the existing Bloomfield WWTP from active service and allow it to be used for wet weather storage. The Bloomfield WWTP is not equipped to handle existing and future flows, and would otherwise require an upgrade. Initial work would also include sludge removal and lagoon preparation for conversion.

Need for Project:

Briefly describe how this project promotes public health or achieves and/or maintains compliance with the Clean Water Act or Safe Drinking Water Act:
Project will eliminate an inadequate and failing treatment plant at Bloomfield and a new pump station at Bloomfield May allow unsewered communities of chaplain & Fairfield to have a conduit to municipal wastewater treatment at Bardstown.

Project Alternatives:

Alternate A:

Build new Bloomfield WWTP (oxidation ditch)

Alternate B:

Build new bloomfield WWTP (contact stabilization)

Alternate C:

Do nothing

Legal Applicant:

Entity Type: City / Municipal Utility

PSC Group ID:

Entity Name: City of Bloomfield

Web URL:

Office EMail: bfield06@bardstowncable.net

Office Phone: 502-252-5235

Toll Free:

Fax: 502-252-9013

Mail Address Line 1: PO Box 206

Phys Address Line 1:

Mail Address Line 2:

Phys Address Line 2:

Mail City, State Zip: Bloomfield, KY 40008

Phys City, State Zip:

Contact: Jean M Jury

Manager: Craig Werner

Contact Title: City Clerk

Manager Title: Public Works Director

Contact EMail: bfield06@bardstowncable.net

Manager EMail: cr.werner@bardstowncable.net

Contact Phone: 502-252-5235

Manager Phone: 502-252-5746

Contact Cell:

Manager Cell:

Authorized Official: Rhonda K Hagan

Auth. Official Title: Mayor

Auth. Official EMail: rhagan@bardstowncable.net

Auth. Official Phone: 502-252-5235

Auth. Official Cell:

Data Source: KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT

Date Last Modified: 09.12.2012



Clean Water Project Profile
SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

Project Administrator (PA) Information

Name: **Ashley S Willoughby**
Title: **Community Development Specialist**
Organization: **Lincoln Trail Area Development District**
Address Line 1: **613 College St Rd**
Address Line 2: **PO Box 604**
City: **Elizabethtown** State: **KY** Zip: **42701**
Phone: **270-769-2393** Fax: **270-769-2993**

Project Engineer (PE) Information:

☒ This project requires a licensed Professional Engineer.

License No: **PE 18511**

PE Name: **Mark A. Sneve**

Phone: **502-583-7020** Fax: **502-583-7026**

E-Mail: **mark.sneve@strand.com**

Firm Name: **Strand Associates, Incorporated**

Addr Line 1: **Strand Associates, Inc.**

Addr Line 2: **325 W. Main St., Ste. 710**

Addr Line 3:

City: **Louisville** State: **KY** Zip: **40202**

Status: **Current** Disciplinary Actions: **NO**

Issued: **11-02-1994** Expires: **06-30-2014**

Engineering Firm Information:

Permit No: **663**

Firm Name: **Strand Associates, Incorporated**

Phone: **502-583-1138** Fax:

Web URL: **http://strand.com/**

E-Mail: **chuck.anderson@strand.com**

Addr Line 1: **910 W. Wingra Dr.**

Addr Line 2:

City: **Madison** State: **WI** Zip: **53715**

Status: **Current** Disciplinary Actions: **NO**

Issued: **11-02-1993** Expires: **12-31-2012**



Clean Water Project Profile
SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

Estimated Budget

Project Cost Classification:

Administrative Exp.:	\$ 25,750
Legal Exp.:	\$ 4,500
Land, Appraisals, Easements:	\$ 207,000
Relocation Exp. & Payments:	
Planning:	
Engineering Fees - Design:	\$ 235,700
Engineering Fees - Construction:	\$ 56,000
Engineering Fees - Inspection:	\$ 129,350
Engineering Fees - Other:	
Construction:	\$ 3,310,000
Equipment:	
Miscellaneous:	\$ 50,000
Contingencies:	\$ 600,000
Total Project Cost:	\$ 4,618,300

Construction Cost Categories:

WWTP Secondary Portion:	
WWTP Advanced Portion:	
Inflow & Infiltration Correction:	
Major Sewer Rehabilitation:	
Collector Sewers:	
Interceptor Sewers, including Pump Stations:	\$ 3,310,000
Combined Sewer Overflow Correction:	
NPS Urban:	
Non-Categorized Cost:	
Total Construction:	\$ 3,310,000

Total Sustainable Infrastructure Costs:

Note: Total Sustainability Infrastructure Costs are included within construction and other costs reported in this section. This breakout is provided for SRF review purposes.

Project Funding Sources:

Total Project Cost: **\$4,618,300**
Total Committed Funding: **\$4,618,300**
Funding Gap: **\$0 (Fully Funded)**

☐ This project will be requesting SRF funding for Federal FY 2014.

Detailed Project Schedule:

Environmental Review Status:

RD Approval:

CDBG Approval:

No approval, but Cross-Cutter
Scooping Completed:

Construction Permit Application Date: **07-01-2011**

Construction Permit Application Status: **Submitted**

KPDES Permit Application Date: **07-01-2011**

KPDES Permit Application Status: **Submitted**

Estimated Bid Date: **06-30-2012**

Estimated Construction Start Date: **07-30-2012**

Funding Source	Amount	Funding Status	Applicable Date
HB 380 NonCoal Grant	\$2,300,000	Committed	8/19/2008
RD Loan	\$2,318,300	Committed	1/25/2012
KIA SRF Fund A Loan (CW)	\$2,341,000	Anticipated	N/A
Total:	\$6,959,300		



Clean Water Project Profile
SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

The following systems are beneficiaries of this project:

DOW PERMIT ID	System Name
KY0021237	Bardstown Sewer System
KY0034436	Bloomfield Sewer System

Project Ranking by AWMPC:

Regional Ranking(s):

Planning Unit Ranking:

Total Points:

Plans and Specifications:

- ☒ Plans and specs have been sent to DOW. 12/1/2010
- ☒ Plans and specs have been reviewed by DOW. 4/19/2011
- ☐ Plans and specs have been sent to PSC.
- ☐ Plans and specs have been reviewed by PSC.

Demographic Impacts (GIS Census Overlay):

	For Project Area	For Included Systems(s)
Serviceable Population		22,988
Serviceable households		9,789
Med. Household Income		\$47,525

New or Improved Service:

	Survey Based	GIS Census Overlay
To Unserved Households		
To Underserved Households		
To Total Households		

Economic Impacts:

Jobs Created	
Jobs Retained	

CW Specific Impacts:

Wastewater Volumes (MGD):

For this project:	
For included system(s):	3.350
Reduced by this project:	

Other CW Specific Impacts:

- ☒ This project provides regionalization and/or consolidation of wastewater treatment systems.
- ☐ This project includes an on-site mound, and/or decentralized WW treatment system.
- ☒ This project is necessary to achieve full or partial compliance with a court order, agreed order, or a judicial or administrative consent decree.
- ☐ This project achieves voluntary compliance (violation with no order).
- ☐ This project is consistent with the approved facility plan.
- ☐ This project will have a positive impact on drinking water sources within a 5 mile radius.



Clean Water Project Profile

SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

Planning Needs:

- ☐ Combined Sewer Overflow (CSO) Correction.
- ☐ Sanitary Sewer Overflow (SSO) Correction.
- ☐ Replacement or Rehabilitation of Aging Infrastructure.
- ☐ New Treatment Plant.
- ☐ New Collector Sewers and Appurtenances.
- ☐ Decentralized Wastewater Treatment Systems.
- ☐ Upgrade to Advanced Treatment.
- ☐ Rehab/Upgrade/Expansion of Existing Treatment Plant.
- ☒ New Interceptor Sewers and Appurtenances.
- ☐ Storm Water Control.
- ☐ Non-Point Source (NPS) Pollution Control.
- ☐ Recycled Water Distribution.
- ☐ Planning.
- ☐ Other (specify):

Project Inventory (Mapped Features):

Point Features:

DOW Permit ID	Count	FeatureType	Purpose	Status	Existing Capacity	Proposed Capacity	Units
KY0034436	2	LIFTSTATION		NEW			

Line Features:

DOW Permit ID	Line Type	Purpose	Activity	Size (in.)	Material	Length (LF)
KY 0034436	SEWER LINE	INTERCEPTOR	EXTENSION	12.00	PVC	54,203
					Total Length	54,203

Administrative Components:

- ☒ Planning ☒ Design ☒ Construction ☐ Management

Wastewater Treatment Plants Eliminated:

- ☒ This project includes the elimination of wastewater treatment plant(s).

DOW Permit ID	Facility Type	System Name	Eliminated Plants	Hydrolic Capacity (MGD)
KY 0034436	PTP	Bloomfield Sewer System	Bloomfield	0.350
			Total	0.350



Clean Water Project Profile
SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

Sanitary Sewer Components:

- ☐ This project includes a new wastewater treatment plant.
Proposed design capacity (MGD): 0.000
- ☐ This project includes an expansion of an existing wastewater treatment plant.
Current design capacity (MGD): 0.000
Current treatment volume (MGD): 0.000
Proposed design capacity (MGD): 0.000
- ☐ This project includes rehabilitation of an existing wastewater treatment plant.
- ☐ This project includes upgrades to an existing wastewater treatment plant.
- ☐ This project includes rehabilitation or replacement of aging infrastructure.
Total length of replaced infrastructure (LF): 0
- ☐ This project includes new collector sewers.
Total length of replaced infrastructure (LF): 0
- ☒ This project includes new interceptor sewers.
Total length of new interceptor sewer (LF): 54,203
- ☒ This project includes elimination of existing sewer system components.
Number of raw sewage discharges eliminated: 1
Number of failing septic systems eliminated:
Number of non-failing septic systems eliminated:

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

Component	Cost
<input type="checkbox"/> Bioretention	\$0
<input type="checkbox"/> Trees	\$0
<input type="checkbox"/> Green Roofs	\$0
<input type="checkbox"/> Permeable Pavement	\$0
<input type="checkbox"/> Cisterns	\$0
<input type="checkbox"/> Constructed Wetlands	\$0
<input type="checkbox"/> Urban Forestry Programs	\$0
<input type="checkbox"/> Downspout Disconnection	\$0
<input type="checkbox"/> Riparian Buffers and Wetlands	\$0
<input type="checkbox"/> Sustainable Landscaping and Site Design	\$0
<input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration.	\$0
<input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.*	\$0
Total Green Infrastructure Cost:	\$0

** Indicates a business case may be required for this item.*

There are no Green Infrastructure components specified for this project.



Clean Water Project Profile
SX21179008 - City of Bloomfield
Bloomfield Pump Station and Forcemain to Bardstown

Sanitary Sewer Components:

- ☐ This project includes a new wastewater treatment plant.
Proposed design capacity (MGD): 0.000
- ☐ This project includes an expansion of an existing wastewater treatment plant.
Current design capacity (MGD): 0.000
Current treatment volume (MGD): 0.000
Proposed design capacity (MGD): 0.000
- ☐ This project includes rehabilitation of an existing wastewater treatment plant.
- ☐ This project includes upgrades to an existing wastewater treatment plant.
- ☐ This project includes rehabilitation or replacement of aging infrastructure.
Total length of replaced infrastructure (LF): 0
- ☐ This project includes new collector sewers.
Total length of replaced infrastructure (LF): 0
- ☒ This project includes new interceptor sewers.
Total length of new interceptor sewer (LF): 54,203
- ☒ This project includes elimination of existing sewer system components.
Number of raw sewage discharges eliminated: 1
Number of failing septic systems eliminated:
Number of non-failing septic systems eliminated:

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

Component	Cost
<input type="checkbox"/> Bioretention	\$0
<input type="checkbox"/> Trees	\$0
<input type="checkbox"/> Green Roofs	\$0
<input type="checkbox"/> Permeable Pavement	\$0
<input type="checkbox"/> Cisterns	\$0
<input type="checkbox"/> Constructed Wetlands	\$0
<input type="checkbox"/> Urban Forestry Programs	\$0
<input type="checkbox"/> Downspout Disconnection	\$0
<input type="checkbox"/> Riparian Buffers and Wetlands	\$0
<input type="checkbox"/> Sustainable Landscaping and Site Design	\$0
<input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration.	\$0
<input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.*	\$0
Total Green Infrastructure Cost:	\$0

** Indicates a business case may be required for this item.*

There are no Green Infrastructure components specified for this project.



Clean Water Project Profile

Legal Applicant:	City of Bardstown	
Project Title:	BARDSTOWN COX	
Project Number:	SX21179014	View Map
Funding Status:	Not Funded	Submitted By: LTADD
Project Status:	Approved	Primary County: Nelson
Project Schedule:	3-5 Years	Planning Unit: Nelson
E-Clearinghouse SAI:		Multi-County: No
Applicant Entity Type:	City / Municipal Utility	ECH Status:
Date Approved (AWMPC):	10-20-2005	

Project Description:

THIS PROPOSED TRANSPORT SYSTEM INCLUDES THE CONSTRUCTION OF A NEW PUMP STATION LOCATED AT THE SITE OF THE EXISTING COX'S CREEK ELEMENTARY SCHOOL PACKAGE TREATMENT PLANT. THE PUMP STATION WOULD BE DESIGNED TO PUMP 180 GPM OF WASTEWATER FROM THE SCHOOL AS WELL AS THE COX'S CREEK COLLECTION SYSTEM. THE PUMP STATION WOULD UTILIZE A 6-INCH FORCE MAIN ALON HWY 31E TO THE BRADSTOWN COLLECTION SYSTEM.

Need for Project:

Briefly describe how this project promotes public health or achieves and/or maintains compliance with the Clean Water Act or Safe Drinking Water Act:

PROJECT WILL ELIMINATE AN INADEQUATE ON-SITE PACKAGE SYSTEM FOR A SCHOOL.

Project Alternatives:

Alternate A:

CONSTRUCT A INTERCEPTOR LINE TO CONNECT AND ACCOMMODATE FLOW FROM COX'S CREEK ELEMENTARY SCHOOL.

Alternate B:

UPGRADE EXISTING PACKAGE PLANT.

Alternate C:

DO NOTHING

Legal Applicant:

Entity Type:	City / Municipal Utility	PSC Group ID:	8800300
Entity Name:	City of Bardstown		
Web URL:			
Office Email:	bbryant@bardstowncable.net		
Office Phone:	502-348-5947	Toll Free:	Fax: 502-348-2433
Mail Address Line 1:	220 N Fifth St	Phys Address Line 1:	
Mail Address Line 2:		Phys Address Line 2:	
Mail City, State Zip:	Bardstown, KY 40004	Phys City, State Zip:	
Contact:	Bobbe Blincoe	Manager:	Larry Hamilton
Contact Title:	City Clerk	Manager Title:	Public Works Director
Contact Email:	bblincoe@bardstowncable.net	Manager Email:	lahamilton@bardstowncable.net
Contact Phone:	502-331-7006	Manager Phone:	502-331-7087
Contact Cell:		Manager Cell:	
Authorized Official:	William S Sheckles		
Auth. Official Title:	Mayor		
Auth. Official Email:	mayorsheckles@bardstowncable.net		
Auth. Official Phone:	502-331-7007	Auth. Official Cell:	
Data Source:	KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT		
		Date Last Modified:	09.12.2012



Clean Water Project Profile

SX21179014 - City of Bardstown
BARDSTOWN COX

Project Administrator (PA) Information

Name: **Larry Hamilton**
Title: **Public Works Director**
Organization: **City of Bardstown**
Address Line 1: **220 N Fifth St**
Address Line 2:
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Fax:

Project Engineer (PE) Information:

☒ This project requires a licensed Professional Engineer.

License No: **PE 15746**

PE Name: **Phillip Benton Hanson**

Phone: **859-223-3755** Fax:

E-Mail: **benton.hanson@hdrinc.com**

Firm Name: **Quest Engineers, Inc.**

Addr Line 1: **Quest Engineers**

Addr Line 2: **881 Corporate Dr., Ste. 100**

Addr Line 3:

City: **Lexington** State: **KY** Zip: **40503**

Status: **Current** Disciplinary Actions: **NO**

Issued: **02-06-1989** Expires: **06-30-2013**

Engineering Firm Information:

Permit No: **157**

Firm Name: **Quest Engineers, Inc.**

Phone: **402-399-1000** Fax: **402-399-1339**

Web URL: **http://www.hdrinc.com/**

E-Mail: **bonnie.kudron@hdrinc.com**

Addr Line 1: **8404 Indian Hills Drive**

Addr Line 2:

City: **Omaha** State: **NE** Zip: **68114**

Status: **Current** Disciplinary Actions: **NO**

Issued: **03-29-1993** Expires: **12-31-2012**



Clean Water Project Profile

SX21179014 - City of Bardstown
BARDSTOWN COX

Project Cost Classification:

Administrative Exp.:	
Legal Exp.:	
Land, Appraisals, Easements:	
Relocation Exp. & Payments:	
Planning:	
Engineering Fees - Design:	
Engineering Fees - Construction:	
Engineering Fees - Inspection:	
Engineering Fees - Other:	
Construction:	\$ 1,960,000
Equipment:	
Miscellaneous:	
Contingencies:	
Total Project Cost:	\$ 1,960,000

Construction Cost Categories:

WWTP Secondary Portion:	\$ 0
WWTP Advanced Portion:	\$ 0
Inflow & Infiltration Correction:	\$ 0
Major Sewer Rehabilitation:	\$ 0
Collector Sewers:	\$ 1,960,000
Interceptor Sewers, including Pump Stations:	\$ 0
Combined Sewer Overflow Correction:	\$ 0
NPS Urban:	\$ 0
Non-Categorized Cost:	
Total Construction:	\$ 1,960,000

Total Sustainable Infrastructure Costs:

Note: Total Sustainability Infrastructure Costs are included within construction and other costs reported in this section. This breakout is provided for SRF review purposes.

Project Funding Sources:

Total Project Cost:	\$1,960,000
Total Committed Funding:	\$0
Funding Gap:	\$1,960,000 (Not Funded)
<input type="checkbox"/> This project will be requesting SRF funding for Federal FY 2014.	

Detailed Project Schedule:

Environmental Review Status:
RD Approval:
CDBG Approval:
No approval, but Cross-Cutter Scoping Completed:
Construction Permit Application Date:
Construction Permit Application Status:
KPDES Permit Application Date:
KPDES Permit Application Status:
Estimated Bid Date:
Estimated Construction Start Date:

Funding Source	Amount	Funding Status	Applicable Date
Pending State Line Item	\$1,960,000	Anticipated	N/A
Total:	\$1,960,000		



Clean Water Project Profile

SX21179014 - City of Bardstown
BARDSTOWN COX

The following systems are beneficiaries of this project:

DOW PERMIT ID	System Name
KY0021237	Bardstown Sewer System

Project Ranking by AWMPC:

Regional Ranking(s):

Planning Unit Ranking:

Total Points:

Demographic Impacts (GIS Census Overlay):

	For Project Area	For Included Systems(s)
Serviceable Population	831	21,621
Serviceable households	331	9,188
Med. Household Income	\$60,076	\$47,205

Economic Impacts:

Jobs Created	
Jobs Retained	

Plans and Specifications:

- ☐ Plans and specs have been sent to DOW.
- ☐ Plans and specs have been reviewed by DOW.
- ☐ Plans and specs have been sent to PSC.
- ☐ Plans and specs have been reviewed by PSC.

New or Improved Service:

	Survey Based	GIS Census Overlay
To Unserved Households		331
To Underserved Households		
To Total Households		331

CW Specific Impacts:

Wastewater Volumes (MGD):

For this project:	
For included system(s):	3.000
Reduced by this project:	

Other CW Specific Impacts:

- ☒ This project provides regionalization and/or consolidation of wastewater treatment systems.
- ☐ This project includes an on-site mound, and/or decentralized WW treatment system.
- ☐ This project is necessary to achieve full or partial compliance with a court order, agreed order, or a judicial or administrative consent decree.
- ☐ This project achieves voluntary compliance (violation with no order).
- ☐ This project is consistent with the approved facility plan.
- ☐ This project will have a positive impact on drinking water sources within a 5 mile radius.



Clean Water Project Profile

SX21179014 - City of Bardstown
BARDSTOWN COX

Planning Needs:

- ☐ Combined Sewer Overflow (CSO) Correction.
- ☐ Sanitary Sewer Overflow (SSO) Correction.
- ☐ Replacement or Rehabilitation of Aging Infrastructure.
- ☐ New Treatment Plant.
- ☒ New Collector Sewers and Appurtenances.
- ☐ Decentralized Wastewater Treatment Systems.
- ☐ Upgrade to Advanced Treatment.
- ☐ Rehab/Upgrade/Expansion of Existing Treatment Plant.
- ☒ New Interceptor Sewers and Appurtenances.
- ☐ Storm Water Control.
- ☐ Non-Point Source (NPS) Pollution Control.
- ☐ Recycled Water Distribution.
- ☐ Planning.
- ☐ Other (specify):

Project Inventory (Mapped Features):

Point Features:

DOW Permit ID	Count	FeatureType	Purpose	Status	Existing Capacity	Proposed Capacity	Units
KY0021237	1	LIFTSTATION		NEW		180.00	GPM

Line Features:

DOW Permit ID	Line Type	Purpose	Activity	Size (in.)	Material	Length (LF)
KY 0021237	SEWER LINE	INTERCEPTOR	EXTENSION	6.00	PVC	21,284
KY 0021237	SEWER LINE	COLLECTOR	EXTENSION	8.00	PVC	13,660
					Total Length	34,944

Administrative Components:

- ☐ Planning ☒ Design ☒ Construction ☐ Management

Wastewater Treatment Plants Eliminated:

- ☒ This project includes the elimination of wastewater treatment plant(s).

DOW Permit ID	Facility Type	System Name	Eliminated Plants	Hydrolic Capacity (MGD)
KY 0096075	PTP	Coxs Creek Elementary School	Coxs Creek Elem School	0.000
			Total	0.000



Clean Water Project Profile

SX21179014 - City of Bardstown

BARDSTOWN COX

Sanitary Sewer Components:

- ☐ This project includes a new wastewater treatment plant.
Proposed design capacity (MGD): 0.000
- ☐ This project includes an expansion of an existing wastewater treatment plant.
Current design capacity (MGD): 0.000
Current treatment volume (MGD): 0.000
Proposed design capacity (MGD): 0.000
- ☐ This project includes rehabilitation of an existing wastewater treatment plant.
- ☐ This project includes upgrades to an existing wastewater treatment plant.
- ☐ This project includes rehabilitation or replacement of aging infrastructure.
Total length of replaced infrastructure (LF): 0
- ☒ This project includes new collector sewers.
Total length of replaced infrastructure (LF): 13,660
- ☒ This project includes new interceptor sewers.
Total length of new interceptor sewer (LF): 21,284
- ☐ This project includes elimination of existing sewer system components.
Number of raw sewage discharges eliminated: 0
Number of failing septic systems eliminated: 0
Number of non-failing septic systems eliminated: 0

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

Component	Cost
<input type="checkbox"/> Bioretention	\$0
<input type="checkbox"/> Trees	\$0
<input type="checkbox"/> Green Roofs	\$0
<input type="checkbox"/> Permeable Pavement	\$0
<input type="checkbox"/> Cisterns	\$0
<input type="checkbox"/> Constructed Wetlands	\$0
<input type="checkbox"/> Urban Forestry Programs	\$0
<input type="checkbox"/> Downspout Disconnection	\$0
<input type="checkbox"/> Riparian Buffers and Wetlands	\$0
<input type="checkbox"/> Sustainable Landscaping and Site Design	\$0
<input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration.	\$0
<input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.*	\$0
Total Green Infrastructure Cost:	\$0

* Indicates a business case may be required for this item.

There are no Green Infrastructure components specified for this project.



Clean Water Project Profile

Legal Applicant:	City of Bardstown	
Project Title:	BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT	
Project Number:	SX21179019	View Map
Funding Status:	Fully Funded	Submitted By: LTADD
Project Status:	Approved	Primary County: Nelson
Project Schedule:	0-2 Years	Planning Unit: Nelson
E-Clearinghouse SAI:	KY200912152025	Multi-County: No
Applicant Entity Type:	City / Municipal Utility	ECH Status: Endorse With Condition
Date Approved (AWMPC):	03-13-2009	

Project Description:

THE CITY OF BARDSTOWN WILL CONSTRUCT APPROXIMATELY 12,500 L.F. OF 12"-14" SEWER FORCE MAIN ALONG U.S. HWY 62 FROM THE KY 162 / U.S. 62 INTERSECTION TO CONNECT THE TOWN CREEK INTERCEPTOR SEWER NEAR BARDSTOWN RESERVOIR NO. 3. THIS PROJECT WILL CONVEY WASTEWATER FROM BLOOMFIELD FOR TREATMENT AT BARDSTOWN'S WWTP AND IS A NECESSARY COMPONENT FOR ELIMINATION OF BLOOMFIELD'S CURRENT WWTP.(ASSOCIATED WITH SX21179008 - BLOOMFIELD CONVEYANCE LINE). THE CITY WILL ALSO INCLUDE REPLACEMENT OF AN EXISTING 8" FORCEMAIN FROM THE POTTERSHOP RD. PUMP STATION TO THE TOWN CREEK INTERCEPTOR SEWER WITH A 12-14" FORCEMAIN, ELIMINATING A BOTTLENECK IN THE CONVEYANCE SYSTEM.

Need for Project:

Briefly describe how this project promotes public health or achieves and/or maintains compliance with the Clean Water Act or Safe Drinking Water Act:

PROJECT WILL IMPROVE FLOW IN THE SYSTEM, ELIMINATING OVERFLOWS AND HELP ACCOMMODATE FLOWS FROM BLOOMFIELD COLLECTION SYSTEM.

Project Alternatives:

Alternate A:

CONSTRUCT NEW FORCEMAIN CONNECTOR TO ACCEPT FLOW FROM BLOOMFIELD AND CONVEY IT TO THE BARDSTOWN WWTP.

Alternate B:

DO NOTHING.

Alternate C:

MAKE IMPROVEMENTS DOWNSTREAM TO BLOOMFIELD GRAVITY SEWERS.

Legal Applicant:

Entity Type: City / Municipal Utility	PSC Group ID: 8800300
Entity Name: City of Bardstown	
Web URL:	
Office Email: bbryant@bardstowncable.net	
Office Phone: 502-348-5947	Toll Free: Fax: 502-348-2433

Mail Address Line 1: 220 N Fifth St	Phys Address Line 1:
Mail Address Line 2:	Phys Address Line 2:
Mail City, State Zip: Bardstown, KY 40004	Phys City, State Zip:
Contact: Bobbe Blincoe	Manager: Larry Hamilton
Contact Title: City Clerk	Manager Title: Public Works Director
Contact Email: bblincoe@bardstowncable.net	Manager Email: lahamilton@bardstowncable.net
Contact Phone: 502-331-7006	Manager Phone: 502-331-7087
Contact Cell:	Manager Cell:

Authorized Official: William S Sheckles	
Auth. Official Title: Mayor	
Auth. Official Email: mayorsheckles@bardstowncable.net	
Auth. Official Phone: 502-331-7007	Auth. Official Cell:
Data Source: KENTUCKY DEPARTMENT FOR LOCAL GOVERNMENT	Date Last Modified: 09.12.2012



Clean Water Project Profile
SX21179019 - City of Bardstown
BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Project Administrator (PA) Information

Name: **Larry Hamilton**
Title: **Public Works Director**
Organization: **City of Bardstown**
Address Line 1: **220 N Fifth St**
Address Line 2:
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Fax:

Applicant Contact (AC) Information

Name: **Larry Hamilton**
Title: **Public Works Director**
Organization: **City of Bardstown**
Address Line 1: **220 N Fifth St**
Address Line 2:
City: **Bardstown** State: **KY** Zip: **40004**
Phone: **502-348-5947** Fax:

Project Engineer (PE) Information:

☒ This project requires a licensed Professional Engineer.

License No: **PE 20849**

PE Name: **Richard Kyle Smith**
Phone: **859-223-3755** Fax: **859-223-3150**
E-Mail: **rich.smith@hdrinc.com**

Firm Name: **Quest Engineers, Inc.**
Addr Line 1: **HDR Engineering Inc.**
Addr Line 2: **2517 Sir Barton Way**
Addr Line 3:
City: **Lexington** State: **KY** Zip: **40509**
Status: **Current** Disciplinary Actions: **NO**
Issued: **04-29-1999** Expires: **06-30-2014**

Engineering Firm Information:

Permit No: **157**
Firm Name: **Quest Engineers, Inc.**
Phone: **402-399-1000** Fax: **402-399-1339**
Web URL: **http://www.hdrinc.com/**
Email: **bonnie.kudron@hdrinc.com**
Addr Line 1: **8404 Indian Hills Drive**
Addr Line 2:
City: **Omaha** State: **NE** Zip: **68114**
Status: **Current** Disciplinary Actions: **NO**
Issued: **03-29-1993** Expires: **12-31-2012**



Clean Water Project Profile
SX21179019 - City of Bardstown
BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Project Cost Classification:

Administrative Exp.:	\$ 20,000
Legal Exp.:	\$ 10,000
Land, Appraisals, Easements:	\$ 10,000
Relocation Exp. & Payments:	
Planning:	\$ 20,000
Engineering Fees - Design:	\$ 90,200
Engineering Fees - Construction:	\$ 22,550
Engineering Fees - Inspection:	\$ 70,270
Engineering Fees - Other:	\$ 44,000
Construction:	\$ 1,336,000
Equipment:	
Miscellaneous:	\$ 42,980
Contingencies:	\$ 134,000
Total Project Cost:	\$ 1,800,000

Construction Cost Categories:

WWTP Secondary Portion:	
WWTP Advanced Portion:	
Inflow & Infiltration Correction:	
Major Sewer Rehabilitation:	
Collector Sewers:	
Interceptor Sewers, including Pump Stations:	\$ 1,336,000
Combined Sewer Overflow Correction:	
NPS Urban:	
Non-Categorized Cost:	
Total Construction:	\$ 1,336,000

Total Sustainable Infrastructure Costs:

Note: Total Sustainability Infrastructure Costs are included within construction and other costs reported in this section. This breakout is provided for SRF review purposes.

Project Funding Sources:

Total Project Cost: **\$1,800,000**

Total Committed Funding: **\$1,800,000**

Funding Gap: **\$0 (Fully Funded)**

☐ This project will be requesting SRF funding for Federal FY 2014.

Detailed Project Schedule:

Environmental Review Status:

RD Approval:

CDBG Approval:

No approval, but Cross-Cutler
Scoping Completed:

Construction Permit Application Date:

Construction Permit Application Status:

Funding Source	Amount	Funding Status	Applicable Date
KIA SRF Fund A Loan (CW)	\$1,800,000	Committed	12/9/2010
Total:	\$1,800,000		

KPDES Permit Application Date:

KPDES Permit Application Status:

Estimated Bid Date:

Estimated Construction Start Date:



Clean Water Project Profile
SX21179019 - City of Bardstown
BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

The following systems are beneficiaries of this project:

DOW PERMIT ID	System Name
KY0021237	Bardstown Sewer System

Project Ranking by AWMPC:

Regional Ranking(s):

Planning Unit Ranking:

Total Points:

Demographic Impacts (GIS Census Overlay):

	For Project Area	For Included Systems(s)
Serviceable Population		21,621
Serviceable households		9,188
Med. Household Income		\$47,205

Economic Impacts:

Jobs Created	
Jobs Retained	

Plans and Specifications:

- ☐ Plans and specs have been sent to DOW.
- ☐ Plans and specs have been reviewed by DOW.
- ☐ Plans and specs have been sent to PSC.
- ☐ Plans and specs have been reviewed by PSC.

New or Improved Service:

	Survey Based	GIS Census Overlay
To Unserved Households		
To Underserved Households		
To Total Households		

CW Specific Impacts:

Wastewater Volumes (MGD):

For this project:	
For included system(s):	3.000
Reduced by this project:	

Other CW Specific Impacts:

- ☒ This project provides regionalization and/or consolidation of wastewater treatment systems.
- ☐ This project includes an on-site mound, and/or decentralized WW treatment system.
- ☐ This project is necessary to achieve full or partial compliance with a court order, agreed order, or a judicial or administrative consent decree.
- ☐ This project achieves voluntary compliance (violation with no order).
- ☐ This project is consistent with the approved facility plan.
- ☐ This project will have a positive impact on drinking water sources within a 5 mile radius.



Clean Water Project Profile
SX21179019 - City of Bardstown
BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Planning Needs:

- ☐ Combined Sewer Overflow (CSO) Correction.
- ☐ Sanitary Sewer Overflow (SSO) Correction.
- ☐ Replacement or Rehabilitation of Aging Infrastructure.
- ☐ New Treatment Plant.
- ☐ New Collector Sewers and Appurtenances.
- ☐ Decentralized Wastewater Treatment Systems.
- ☐ Upgrade to Advanced Treatment.
- ☐ Rehab/Upgrade/Expansion of Existing Treatment Plant.
- ☒ New Interceptor Sewers and Appurtenances.
- ☐ Storm Water Control.
- ☐ Non-Point Source (NPS) Pollution Control.
- ☐ Recycled Water Distribution.
- ☐ Planning.
- ☐ Other (specify):

Project Inventory (Mapped Features):

Point Features:

DOW Permit ID	Count	FeatureType	Purpose	Status	Existing Capacity	Proposed Capacity	Units
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Line Features:

DOW Permit ID	Line Type	Purpose	Activity	Size (in.)	Material	Length (LF)
KY 0021237	SEWER LINE	INTERCEPTOR	EXTENSION	12.00	PVC	17,752
					Total Length	17,752

Administrative Components:

- ☐ Planning ☒ Design ☒ Construction ☐ Management

Wastewater Treatment Plants Eliminated:

- ☒ This project includes the elimination of wastewater treatment plant(s).

DOW Permit ID	Facility Type	System Name	Eliminated Plants	Hydrolic Capacity (MGD)
KY 0034436	PTP	Bloomfield Sewer System	City of Bloomfield Wastewater Treatment Plant	0.350
			Total	0.350



Clean Water Project Profile
SX21179019 - City of Bardstown
BARDSTOWN-BLOOMFIELD SEWER CONNECTION PROJECT

Sanitary Sewer Components:

- ☐ This project includes a new wastewater treatment plant.
Proposed design capacity (MGD): 0.000
- ☐ This project includes an expansion of an existing wastewater treatment plant.
Current design capacity (MGD): 0.000
Current treatment volume (MGD): 0.000
Proposed design capacity (MGD): 0.000
- ☐ This project includes rehabilitation of an existing wastewater treatment plant.
- ☐ This project includes upgrades to an existing wastewater treatment plant.
- ☐ This project includes rehabilitation or replacement of aging infrastructure.
Total length of replaced infrastructure (LF): 0
- ☐ This project includes new collector sewers.
Total length of replaced infrastructure (LF): 0
- ☒ This project includes new interceptor sewers.
Total length of new interceptor sewer (LF): 17,752
- ☐ This project includes elimination of existing sewer system components.
Number of raw sewage discharges eliminated: 0
Number of failing septic systems eliminated: 0
Number of non-failing septic systems eliminated: 0

Sustainable Infrastructure - Green Infrastructure:

Green stormwater infrastructure includes a wide array of practices at multiple scales that manage wet weather and that maintains and restores natural hydrology by infiltrating, evapotranspiring and harvesting and using stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains, and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale, green infrastructure consists of site and neighborhood-specific practices, such as:

Component	Cost
<input type="checkbox"/> Bioretention	\$0
<input type="checkbox"/> Trees	\$0
<input type="checkbox"/> Green Roofs	\$0
<input type="checkbox"/> Permeable Pavement	\$0
<input type="checkbox"/> Cisterns	\$0
<input type="checkbox"/> Constructed Wetlands	\$0
<input type="checkbox"/> Urban Forestry Programs	\$0
<input type="checkbox"/> Downspout Disconnection	\$0
<input type="checkbox"/> Riparian Buffers and Wetlands	\$0
<input type="checkbox"/> Sustainable Landscaping and Site Design	\$0
<input type="checkbox"/> Purchase of land or easements on land for riparian and wetland protection or restoration.	\$0
<input type="checkbox"/> Fencing to divert livestock from streams and stream buffers.*	\$0
Total Green Infrastructure Cost:	\$0

** Indicates a business case may be required for this item.*

There are no Green Infrastructure components specified for this project.